

# AUTOMOTIVE INDUSTRIES

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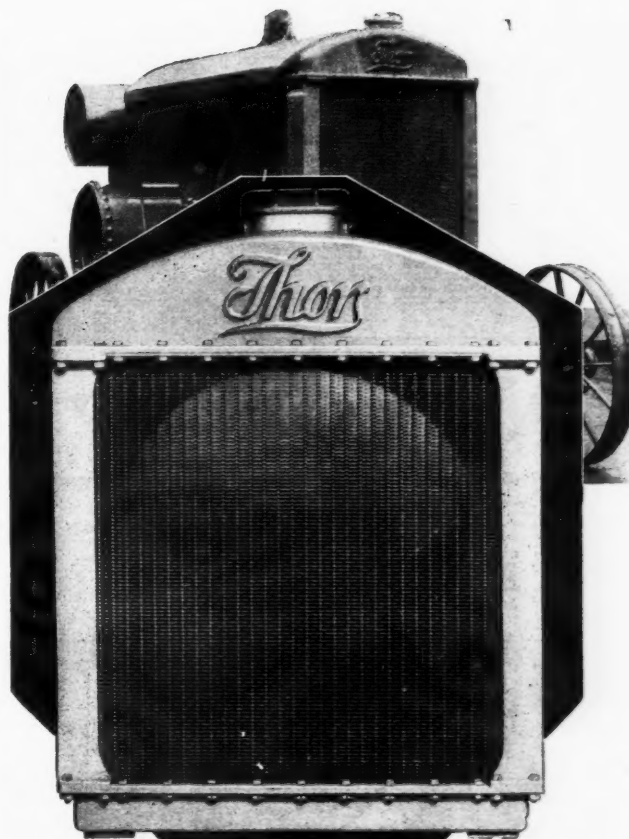
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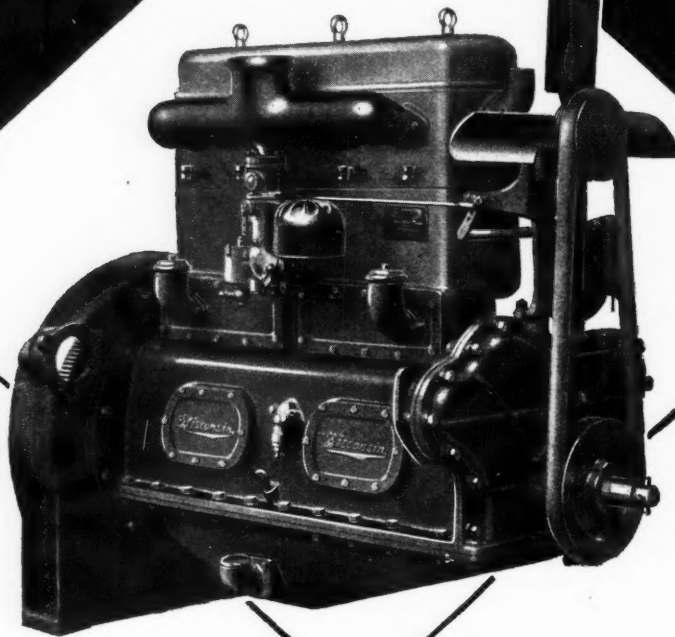
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## Disparity in Truck License Fees *a Problem for Industry*

Proper development of motor transport in some sections of country handicapped by high rates arbitrarily fixed.  
Uniform system of State taxation is needed.

By K. W. Stillman

WHILE there continues to be considerable agitation concerning the amount of taxes which should be paid by motor vehicle owners for their use of the public highways, there are still few signs of any agreement among the various States as to what these taxes should be, nor any strong indications that attempts are being made to solve the problem scientifically.

Nowhere is this better illustrated, perhaps, than in the fees charged for licensing a truck of given specifications and operating characteristics as shown in the accompanying table. Opinion is quite united now that motor vehicle operators, in toto, are paying a fair share of the burden of maintaining public highways but the facts presented in this table indicate that the most equitable distribution of these costs among the various types and sizes of vehicles using the roads has by no means been fully agreed upon.

Imagine the chaotic conditions indicated by the fact that a truck operator can get a license for a truck of certain specifications for the total sum of \$1 in one political subdivision of the country, but if he should move his operations a few hundred miles south into another State it would cost him \$720 to license the identical truck for the same purpose.

The danger of this condition, aug-

mented by the fact that the present tendency is to increase license fees rather than to decrease them, is that taxation imposed without definite knowledge of its effects may easily become a serious obstacle in the future development of certain sizes or types of motor vehicles which are necessary to the economic progress of the country.

The automotive industry has taken great interest in motor vehicle taxation problems as a whole and it is largely through the efforts of its leaders that taxation, in general, has been kept at a level which has permitted the enormous development in automotive use during the past decade.

May it not be advisable now for the industry to concentrate its efforts toward equalizing the distribution of automotive taxes so that passenger cars, trucks and buses of all types, classes and sizes may reach their fullest possible usefulness?

Without attempting to formulate any ideal method of apportioning taxes, it might be useful here to collate the various theories upon which the present methods apparently are based and to illustrate what appear to be their particular advantages and disadvantages. The importance of trucks in our transport system and the evident lack of agreement among the States as to how they should be taxed make this



*A truck operator can get a license for a truck of certain specifications for \$1 in one political subdivision of the country, but if he should move his operations a few hundred miles south into another State it would cost him \$720 to license the identical truck for the same purpose*



class of vehicles a good one to use for our analysis.

The table accompanying this article gives license fees imposed as of Jan. 1, 1928, in the various States for the operation of a truck with the following specifications: Capacity 6000 lb.; weight 7000 lb.; 30 hp.; value \$4,500; annual gross receipts \$12,000; annual mileage 20,000; equipped with four pneumatic tires with a total width of 20 in.

In order to permit comparisons of present license fees with those of two years ago these specifications are identical with those used by Henry R. Trumbower, economist of the Bureau of Public Roads, who made a similar study as of Jan. 1, 1926, the results of which are shown in the table for comparative purposes.

The table divides trucks into three classes but, because of the lack of uniformity among the States in their legislative actions, direct comparison between States in the two classes of trucks operated for hire are not always possible.

#### Common Carrier Trucks

In only nine States are common carrier trucks specifically mentioned and given special consideration in determining license fees. In many States no distinction is made between trucks privately owned and operated and those operated for hire, while in the remainder trucks operated for hire are divided between those operating over regular routes or between fixed termini and those not so operated. For the purpose of this table trucks operated for hire over regular routes or between fixed termini have been included with common carrier trucks mainly because when there is a difference in license fees imposed upon various classes these two are invariably taxed more than other trucks for hire.

In so far as legislators have had any definite theory upon which to base motor truck taxation, three different methods appear to have been employed either separately or in combination. These may be designated as the "Use of the road" theory, the "Privilege" theory and the theory of charging what the traffic will bear.

The first theory is, of course, based upon the supposition that motor vehicles should be made to pay for the damage they do the highways over which they travel and license fees based upon gross weight, capacity, mileage, tire equipment, etc., are imposed with this idea in mind.

Obviously, none of these factors nor any combination of them can accurately measure road use. A few States have taken the ton-mile as being the best criterion but this, too, is subject to criticism. Operating over a light surfaced highway, for example, there is no comparison between the damage done by a ton-mile contributed by a well-sprung passenger car equipped with balloon tires and shock absorbers and a ton-mile contributed by a 5-ton truck, possibly overloaded, traveling 30 m.p.h. or more and equipped with solid tires.

#### Destruction Due to Impact

Studies made by various agencies have demonstrated that the destruction done to roads by abrasion is negligible but that impact is the destructive force. If taxation were distributed between passenger cars and heavy trucks according to their actual destructive power on light surfaced roads, the former would pay practically nothing while heavy trucks might be taxed out of existence.

But still another factor enters the situation when one learns on the authority of both Secretary Jardine of the Department of Agriculture and Thomas H. MacDonald, chief of the Bureau of Public Roads, that even the heaviest trucks have practically no destructive

### License Fees Charged by States for a 3-Ton Truck of Given Specifications

	Privately Owned and Operated	For Hire, No Reg. Route Non-common Carrier	For Hire, No Reg. Route Non-common Carrier	For Hire, No Reg. Route Non-common Carrier	Over Routes Common Carrier
	1928	1926	1928	1928	1926
Alabama .....	\$100.00	....	\$100.00	\$230.00	....
Arizona .....	33.50	\$15.00	33.50	333.50	\$120.00
Arkansas .....	125.00	125.00	427.50	*	187.50
California .....	18.00	18.00	18.00	603.00	498.00
Colorado .....	80.00	....	80.00	350.00	....
Connecticut .....	52.50	....	52.50	*	....
Delaware .....	52.00	....	52.00	*	....
Dist. of Col. ....	1.00	....	1.00	*	....
Florida .....	195.00	....	195.00	*	....
Georgia .....	45.00	....	45.00	*	....
Idaho .....	65.00	65.00	115.00	*	600.00
Illinois .....	75.00	75.00	205.00	*	205.00
Indiana .....	35.00	....	35.00	*	....
Iowa .....	100.00	100.00	425.00	*	425.00
Kansas .....	45.00	45.00	185.00	*	185.00
Kentucky .....	95.00	....	95.00	*	....
Louisiana .....	140.40	....	140.40	*	....
Maine .....	55.00	....	55.00	*	....
Maryland .....	9.60	9.60	9.60	260.00	433.33
Massachusetts ..	65.00	....	65.00	*	....
Michigan .....	87.50	87.50	157.50	*	157.50
Minnesota .....	108.00	108.00	450.00	*	450.00
Mississippi .....	82.50	82.50	123.75	*	123.75
Missouri .....	18.00	....	18.00	*	....
Montana .....	37.50	37.50	47.50	*	47.50
Nebraska .....	60.00	....	60.00	*	....
Nevada .....	39.00	39.00	39.00	170.00	480.00
New Hampshire ..	35.00	....	35.00	*	....
New Jersey .....	30.00	....	30.00	*	....
New Mexico .....	30.00	30.00	50.00	*	70.00
New York .....	32.00	....	32.00	*	....
North Carolina ..	75.00	200.00	75.00	720.00	720.00
North Dakota ..	107.00	82.00	127.00	142.00	132.00
Ohio .....	70.00	70.00	100.00	140.00	140.00
Oklahoma .....	80.00	60.00	120.00	*	100.00
Oregon .....	35.00	35.00	95.00	*	45.00
Pennsylvania .....	80.00	....	80.00	*	....
Rhode Island .....	25.00	....	25.00	*	....
South Carolina ..	60.00	60.00	50.00	150.00	150.00
South Dakota ..	75.00	75.00	435.00	*	360.00
Tennessee .....	35.00	....	35.00	*	....
Texas .....	33.25	....	33.25	*	....
Utah .....	40.00	40.00	436.00	*	400.00
Vermont .....	45.50	....	45.50	*	....
Virginia .....	60.00	60.00	110.00	240.00	520.00
Washington .....	67.50	25.50	185.00	*	209.00
West Virginia ..	56.25	56.25	112.50	150.00	150.00
Wisconsin .....	30.00	....	30.00	190.00	....
Wyoming .....	50.00	....	50.00	75.00	....

\* No special provisions.

effects upon highways which have been built to meet heavy traffic requirements.

In an analysis of this situation made a short time ago by Mr. MacDonald he stated that no account need be taken of the destructive forces of trucks until gross weights of over three tons are reached. This opinion was based on the fact that good roads would be necessary for passenger car use whether or not any trucks were ever operated over them. Loaded passenger cars may attain gross weights of three tons so that highways must be built to carry these loads without consideration of truck use. On such highways, Mr. MacDonald maintained, pneumatic-tired trucks of not more than three tons gross weight have no more destructive effects than do passenger cars, so that if taxation is to be levied strictly according to damage done to highways they should be taxed no more than passenger cars.

If trucks of greater gross weight than three tons are to be operated over the highways a heavier type of road



construction must be employed or the surface will quickly be destroyed. To care for gross loads up to 12 tons, Mr. MacDonald estimates that two inches additional thickness would be required in a concrete road or an added expense of about \$10,000 per mile.

With such a highway, he again points out, the heaviest trucks permitted to operate would have practically no destructive effects, so strict taxation according to road use would only add to the heavy truck fees the amount necessary to amortize the additional cost of road construction.

In addition to taxation of the supposed destructive action of motor vehicles on highways the "use of the road" theory considers the actual mileage covered. It may have been considered by some State authorities that common carrier trucks and trucks operated for hire over regular routes are likely to accumulate a greater mileage than contract carriers operating more irregularly and that the latter, in turn, are likely to run up a higher annual mileage than trucks privately owned and operated, and the tax based accordingly.

In making use of the "privilege" theory of motor vehicle taxation some State legislatures have distinguished between truck operation which utilizes the highway as an incidental part of the owner's business and operations in which the public highways are a very important element in the enterprise. In accordance with this line of reasoning a considerable number of States impose larger fees on trucks operated for hire than on privately-owned and operated trucks.

Considered simply from a transportation and road use standpoint, this theory may be justified but there are other influences not readily discernible which should be taken into account.

#### Results in Higher Costs

In the last analysis, license fees for trucks are paid by the goods transported. The license fees paid by trucks operated for hire are included in the charges made for transporting goods, and an increase in fees for this type of vehicle results in an increase in the tariff charged. Now, while many small concerns own and operate their own trucks, it is true, in general, that large concerns are in a better position to own and operate their own trucks or fleets than small concerns which are more likely to patronize the contract and common carrier trucks. The economics of truck transportation which make necessary more constant truck use than the volume of business offered by most small enterprises permits, justifies this assumption.

In consideration of this point, then, the States which impose higher license fees upon trucks operated for hire are, in effect, penalizing small business concerns to some extent at least in favor of large enterprises. Whether this is in agreement with proper legislative policies may be questioned.

Now we come to the final theory, that of charging what the traffic will bear and, fundamentally, this is the basis upon which all taxation, that of motor vehicles in particular, has been based. Motor vehicles have been made a legitimate source of revenue and the history of legislation illustrates that a more or less standard method has been employed. A high rate has been suggested by the legislature which has met with strong opposition from automotive makers, dealers and users. Then follows series of conferences during which the opposing interests are brought together until the tax is fixed at as high a point as can be reached without bringing forth too much opposition.

In addition to this fundamental reasoning underlying all taxation legislation, in the motor vehicle field there

have been desultory attempts to adapt the methods used by railroads in apportioning freight rates among the various commodities carried.

Passenger car license fees are based almost entirely upon this basis. Passenger cars are taxed far more than the extent of damage they do to the highways would justify and the "privilege" which any one owner has in the use of roads is shared by 15 or 20 million other citizens who probably pay a very large share of all taxes.

Passenger cars are so convenient, they afford so much pleasure and are so generally desirable, however, that few owners object to the payment of relatively high fees for licenses and in gasoline taxes for highways which make automotive transportation possible.

#### A Business Proposition

Trucks are considered in a slightly different category. Truck owners are relatively few in number and in operating their trucks over the public highways they enjoy a privilege which is not shared by all their neighbors. In addition, to a greater extent than is the usual case with passenger cars, truck operation is utilized for business purposes, for making profits for its owner.

Considering this, it is possible that some legislators have attempted to distinguish between different classes of trucks according to the profits which their use brings to the owners. Privately-owned and operated trucks are usually incidental elements in an enterprise while trucks operated for hire are the sole or principal enterprise in which their owners are engaged. For this reason it may have been assumed that when the truck operation is such as to bring in direct returns to its owner he should be in a position to pay more for the use of the highways than an owner who obtains no direct returns from truck operation.

Carrying this idea still further, many State authorities apparently believe that a common carrier truck or a contract truck with regular routes is likely to earn more by its operation than one which has not built up a regular business so they feel justified in taxing trucks of the former type higher than the latter.

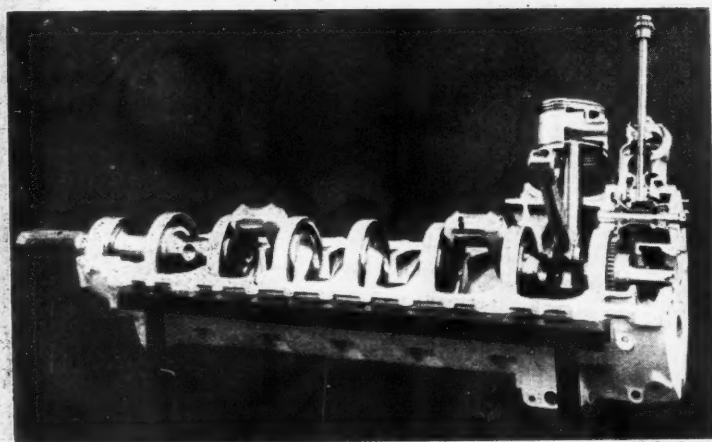
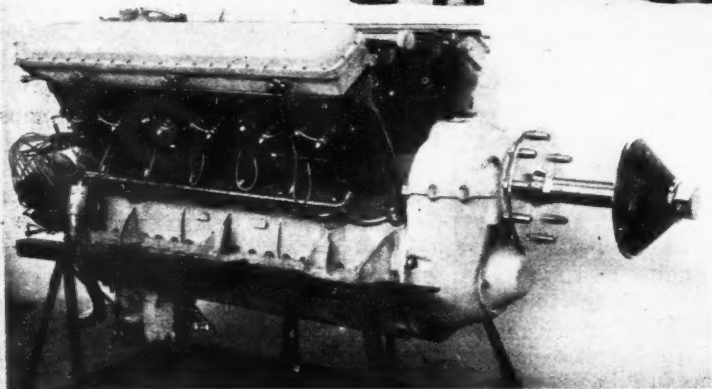
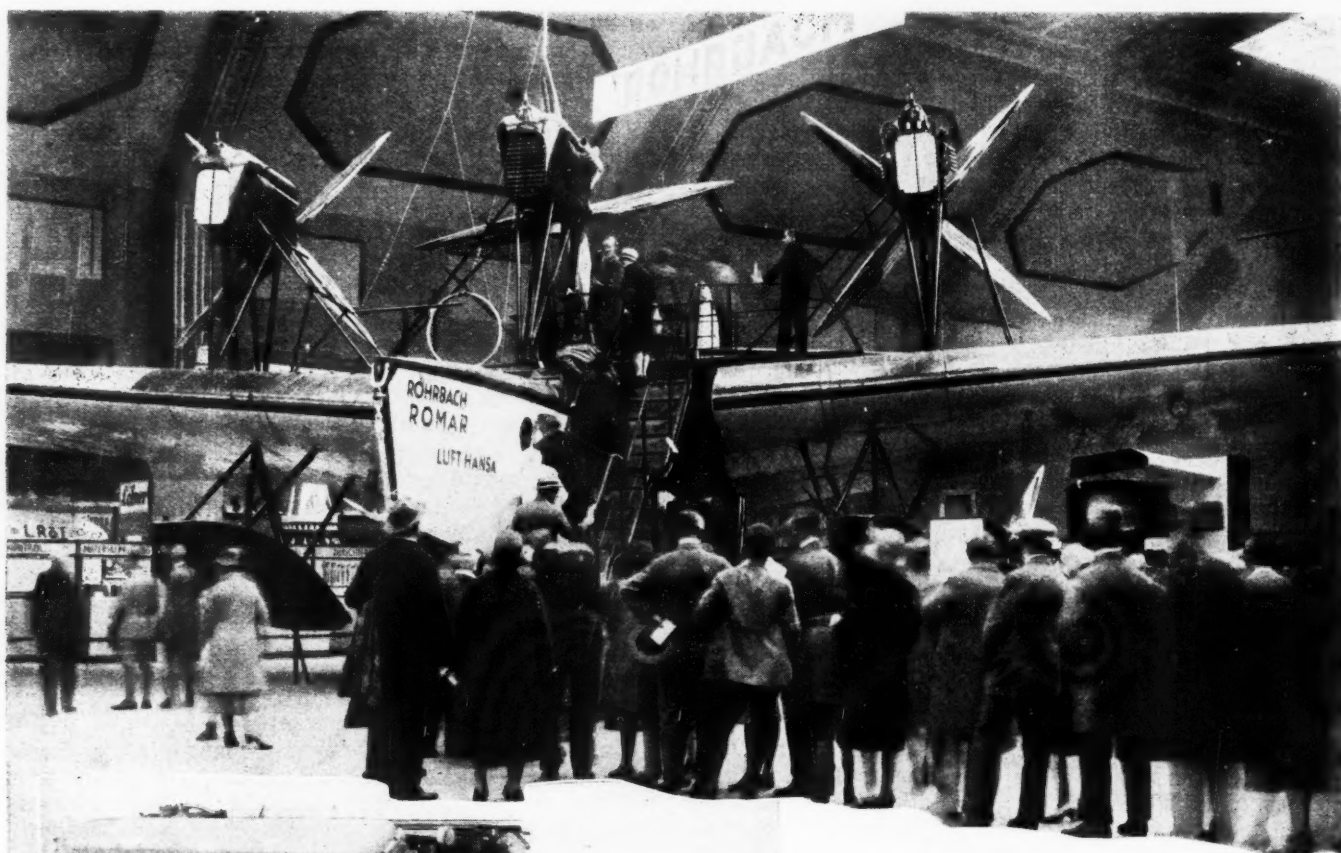
In this connection it may be of interest to compare the status of motor transport agencies with railroads. Spokesmen for the latter are inclined to make much of the fact that railroads must construct and maintain their own roadbeds while, they claim, motor carriers operate over public highways toward the construction and maintenance of which the motor carrier operators contribute but a small proportion of the amount required. These claims have been made frequently by railroad spokesmen in their attempts to convince legislative and judicial authorities that motor transport may or does constitute unfair competition under certain circumstances.

#### Fair Return is Assured

No mention is made of the fact, however, that rail rates are fixed by Federal authority so that a fair return shall be made on the railroads' investment and in this investment is included their expenditures for roadbed. This has not been done for motor transport.

With all of these conflicting influences at work it is not surprising possibly that more progress has not been made in determining a scientific basis for truck licensing which would be acceptable to all parties interested. Whether such an ideal formula will ever be evolved is not at all certain but it is certain that the very great differences in methods now employed are unnecessary, antiquated and quite likely to be harmful to the fullest development of motor truck use.

# Latest in *European* Aircraft



THE International Aircraft Show which was opened at Berlin on Sunday, Oct. 7, by the German Minister of Transport, was confined to commercial and sport planes and was a remarkable display of the productions of aircraft engineering in other than military lines.

Airplanes were exhibited by 15 German and 19 foreign makers. All of the German machines were housed together in one large hall, while the foreign exhibits occupied another hall, the two buildings being connected by a bridge. There were representative exhibits of the French, British, Czechoslovakian, Belgian, Dutch and Russian aircraft industries. This was the first time the Russian industry presented its products at an international show, and it had a very creditable exhibit, including an

*Top—Crowd standing in line at International Aircraft Show to inspect the giant Rohrbach flying boat "Romar." Center—New Junkers L-88 engine, a 12-cylinder V-type. Bottom—Junkers crankshaft, showing use of ball bearings*

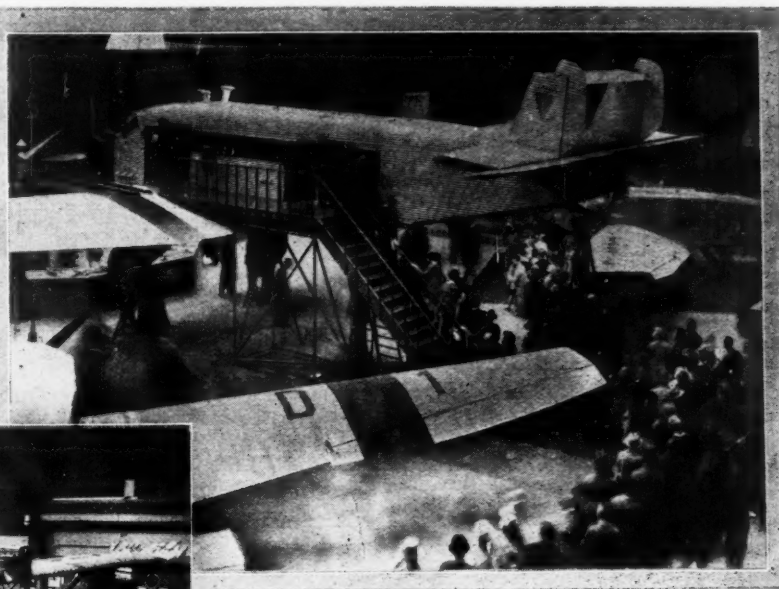


# Development Seen at *Berlin*

*All-Russian plane a feature of international exhibit.*

*Huge Rohrbach flying boat carries 16.*

By Edwin P. A. Heinze



Above—Crowds inspecting the Junkers G-31 plane, which has three air-cooled Juniper engines and is capable of carrying 20 passengers, and the "Bremen," of trans-Atlantic fame.  
Left—A large Dornier flying boat

all-metal biplane for ambulance and mail service which was built entirely of Russian steel and aluminum and was equipped with an all-Russian 12-cylinder water-cooled engine.

As regards planes, there was little of outstanding novelty at the show, with the possible exception of the huge Rohrbach flying boat, the Romar, a sister ship of which had just previously completed its test flights over the Baltic. The Romar is of characteristic Rohrbach design, but the wings taper pronouncedly toward the tips, both in plan and section. The same as in other Rohrbach machines, they are built up of a central box-girder to which the nose parts (fairings) and trailing edges are separately secured.

The wings have a slight dihedral angle and are fastened to the hull by means of four bolts each; they have a span of 121 ft. and a surface area of 1830 sq. ft. The hull is comparatively short, its length being 72.2 ft., and with the propellers running the ship has a height of 27.9 ft. Her flying weight is no less than 41,900 lb., and the ratio of weight to wing area therefore is as high as 22.9 lb. p. sq. ft. The draught of the ship is 4.26 ft. and she is equipped with three water-cooled 12-cylinder BMW engines. These have a normal output of 500 hp. and a maximum of 720 hp. This ship will carry 12 passengers in addition to a crew of four, besides mail and luggage. The engines are located in nacelles supported by a system of faired steel struts above the body and wings, the central engine being set

slightly in advance of the two on the wings. The wings have stabilizing floats under the engines.

Another large multi-engined plane on view was the Junkers G-31, which is equipped with three air-cooled Jupiter engines and is capable of carrying 20 persons, including a crew of four. Then there was the big Dornier "Superwhale" flying boat, and in the "foreign" hall a full-size section of the new Farman passenger plane already exhibited at Paris.

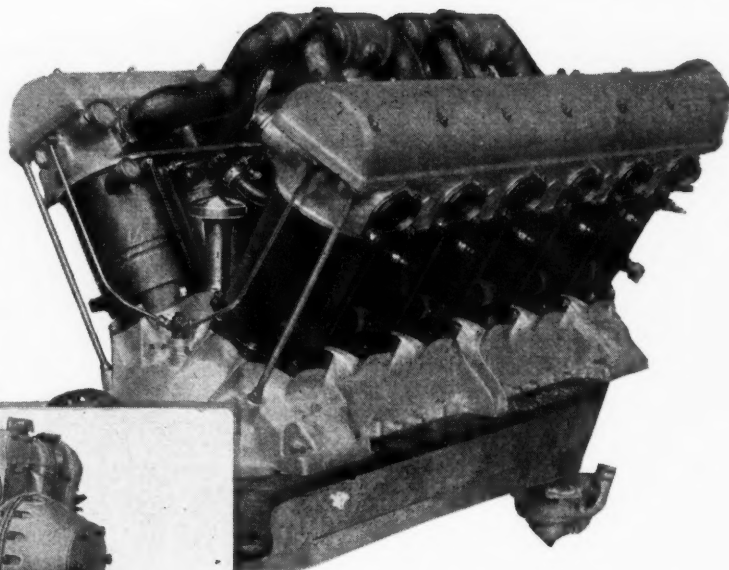
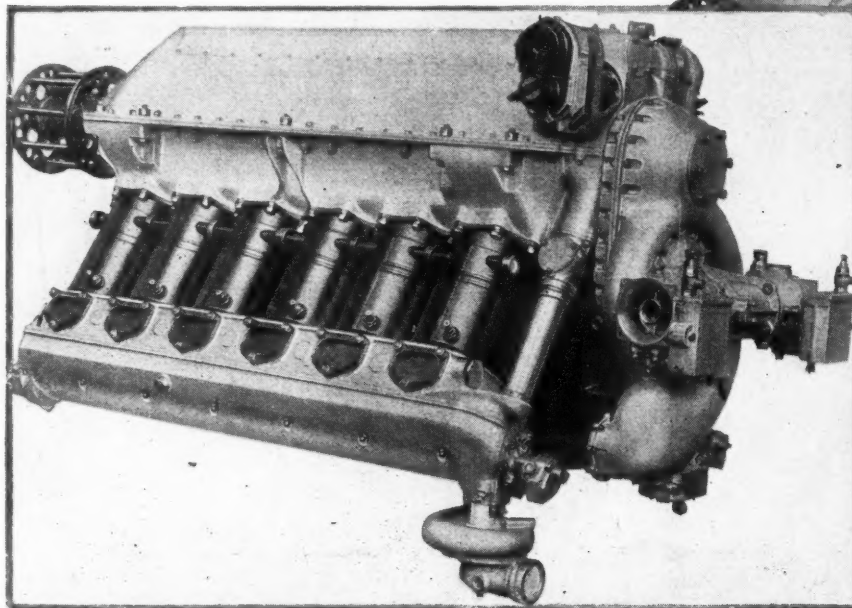
## Smaller Companies Active

Quite a number of new planes built by German makers were seen at the show, and it is notable that the smaller companies are now displaying great initiative. Thus, for instance, the Bayerische Flugzeug-Werke (not to be confounded with the Bayerische Motoren-Werke, manufacturers of the well-known BMW aircraft engines) of Augsburg are making a determined bid for a place of rank with a full series of models. They have recently produced a 10-passenger all-metal monoplane and a small four-passenger machine of high quality. These machines have been favorably received by German air services, especially in the South. They were designed by an engineer with much experience in soaring, and are said to be exceptionally economical.

Mention should be made also of the numerous miniature planes at the show, most of them by German makers. If flying is ever to become popular in the sense that motoring is popular, makers must produce small



machines that are cheap and very economical in upkeep. The foremost plane of this type in Europe, next to the British de Havilland "Moth," is probably the small monoplane built by the German Klemm Co. (former Klemm-Daimler). This holds numerous records and is one of the cheapest airplanes extant, for it cost less than \$1,600. It carries two persons at speeds up to 60 and even 70 m.p.h., although it is equipped with an engine of only 20 hp., a two-cylinder Mercedes. The Klemm, which until recently was built of wood and fabric, is now supplied entirely of wood, and if desired is equipped with a



Above—The new Argus 12-cylinder, 700-hp. engine. Left—Argus 12-cylinder, 700-hp. inverted engine

40 hp. Salmson engine. The Bayerische Flugzeug-Werke have built a similar machine with wings that fold back, which costs about \$200 more. Then there was also a very smart little biplane, equipped with a three-cylinder Anzani engine, made by the Raab-Katzenstein works of Kassel, another of the enterprising young airplane works in Germany. The machine is even cheaper than the Klemm. Its fuselage is built up of steel tubing, and aluminum tubes are embodied in the wings which are mainly of wood construction.

Numerous new engines were exhibited, but most of those of foreign manufacture had already been seen at Paris. Some of the German engines had only just passed the official tests, or were undergoing them at the time of the show. Two former German aircraft engine makers who had been out of the business for many years have now reentered it, namely, Daimler-Benz and Argus. The leading German makers undoubtedly still are BMW, Junkers and Siemens. These three and the two new comers (if one may so call them) will be very keen competitors, for the market in Germany is practically confined to the requirements of the German Airways Co. (Deutsche Luft Hansa) and all are building large engines.

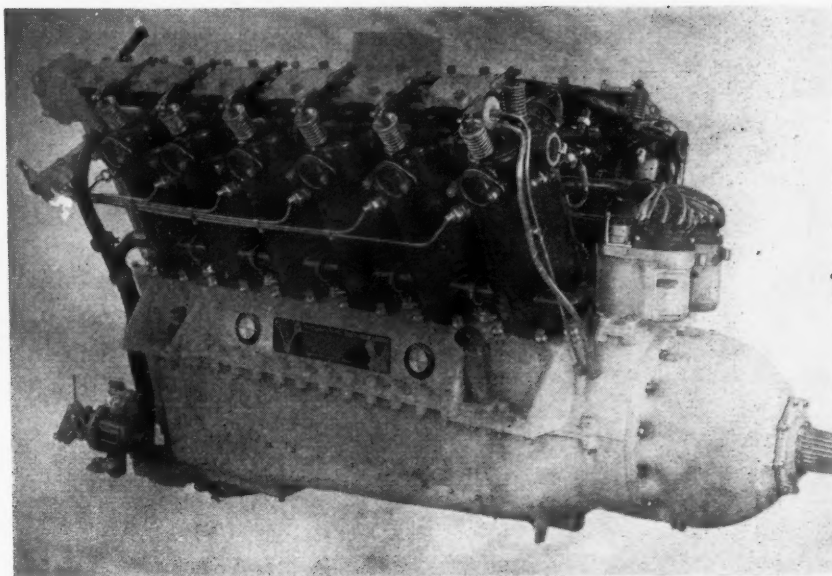
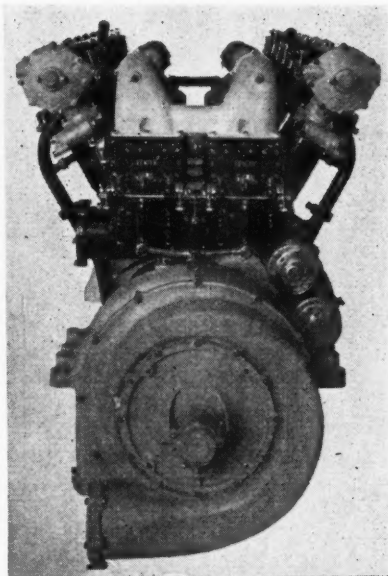
BMW, founded in 1916-17, dropped aircraft engine manufacture after the war, but took it up again in 1923. By the end of the war it had attained an output of 200 engines per month and therefore had acquired much experience. Russia, Czechoslovakia and Japan hold manufacturing rights for BMW engines and the makers also export a considerable part of their production. The latest BMW products at the show were a

12-cylinder and two new six-cylinder water-cooled engines, the last of which had only just passed the official tests.

One of the new six-cylinder engines, Type V, has all cylinders in line and formed in a single block, which has the advantage of great rigidity. This idea, of course, is not new, but BMW has carried it out very neatly. The steel cylinders, each with a lower flange, are inserted in a common water jacket of aluminum or magnesium alloy. The block has a single detachable aluminum cylinder head with valve seats of steel let into the softer metal. The bore is 6.49 and the stroke 7.48 in. At present this engine seems to be regarded more in the light of an experiment, though the results are said to have been entirely satisfactory. It has a maximum output of 410 and a normal output of 320 hp. The fuel consumption is given as 0.485 lb. per. hp.-hr. and the weight, dry, as 837 lb.

#### Difficult to Dismantle

Though the block construction has the advantage of being very rigid, it is more difficult to dismantle for inspection and small repairs. This has led BMW to design another new engine, Type VIII, incorporating experience gained with Type V. This has separate steel cylinders with welded-on water jackets and detachable individual aluminum heads, with inserted steel valve seats. The special feature of this engine is its shortness, which is due to a special design of the heads. These are screwed down on the cylinder flanges from beneath, in such a way as to make it possible to place the cylinders very close together. The cooling water connections are by short lengths of rubber hose. This engine is essentially a high-speed one. It has a smaller bore (6.29 in.) and a shorter stroke (7.08 in.) than the Type V, and it develops 530 hp. at a speed of 2400 r.p.m., the compression ratio being 7.3. A Farman gear reduces the crankshaft speed by one-half. The normal output is 400 hp. at 2190 r.p.m. With this compression



Left—Rear view of latest BMW 12-cylinder engine with Rateau blower. Right— Side view of same engine

ratio a mixture of four parts of benzol and one part gasoline is required. The engine may also be had with compression ratios of 6 and 5.5. With the high ratio first mentioned the fuel consumption is 0.485 lb. per hp.-hr. The overhead camshaft and valve operating mechanism are wholly inclosed. It is intended to build a 12-cylinder V-engine with these features, and the BMW people expect it to develop a normal output of 1000 hp.

The new 12-cylinder BMW engine already referred to, in addition to having a Farman reduction gear, is equipped with a Rateau supercharger, which enables it to maintain an output of 600 hp. up to an altitude of 18,000 ft. The cylinder banks make an angle of 60 deg. with one another and have a bore of 6.29 in. and a stroke of 7.48 in. The maximum power is 755 hp. As in the case of the six-cylinder design, the drives of the auxiliaries are placed at the front end, in order to prevent injurious vibrations. The BMW firm recently also entered the air-cooled engine field, having secured manufacturing rights from the Pratt & Whitney Aircraft Co. for the "Hornet" and "Wasp" engines. An original Hornet engine was exhibited, no engines of German production having been completed at the time of the show. BMW are experiencing great difficulty in finding works in Germany capable of supplying crankcases of the right quality and workmanship.

#### Junkers Diesel Engine

The Junkers stand also was very interesting, as it contained not only the big airplane already mentioned and the Bremen, but also the latest Junkers' engines, as well as displays bearing on the research work done by this company. A feature of special interest was a huge five-cylinder Diesel engine of the well-known Junkers two-stroke type. This engine has two crankshafts, one above and the other below the cylinders, which are connected at one end by a train of gears. It is an experimental engine mounted on a test stand, and full particulars were not available. It is said to develop 800 hp. but it weighs about 6½ lb. per hp.

The general tendency in Germany is toward high-speed aircraft engines with reduction gears, and Junkers also is working in this direction. The new engines included a six-cylinder and a V-12, both with a bore of

6.29 and a stroke of 7.48 in. The crankshafts are fitted with vibration dampers and run in roller bearings. As compared with former Junkers engines the principal change is in the valve gear. There now are four (instead of two) valves per cylinder, and they are operated by two camshafts over each row of cylinders. The cams operate the valves directly without intermediate parts. Owing to the use of a vibration damper, which, according to Junkers, reduces the torsional vibration by about 50 per cent, an ordinary spur wheel reduction gear, with a ratio of 2:1, was found practicable. The speed of both new engines is 2100 r.p.m., and with a compression ratio of 5.5 to 1 the six develops 420 and the twelve 850 hp. The weight of the former is 881 and that of the latter 1433 lb.

#### Turbo-Compressor Used

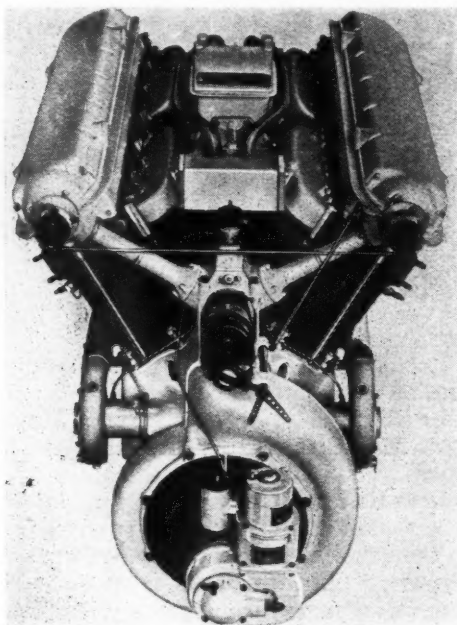
Mention should be made also of the Junkers blower, which was used on the old 12-cylinder engine and will be used also on the new. It is a two-stage turbo-compressor driven from the crankshaft through a spur gear train in a ratio of 1 to 7.4. A hydraulic clutch is interposed. This works on the gear-pump principle and is adjustable while in motion.

A very simple fuel pump designed by Junkers was also shown. Its mode of operation will be best understood by reference to the diagram. There are three oscillating cylinders arranged radially. The plungers are operated by a common eccentric and while moving up and down in their cylinders they also oscillate, thereby opening the ports. It is claimed that the three cylinders insure a constant flow of fuel. As the pump is lubricated under a pressure exceeding that which it puts on the fuel, lubrication troubles are said to be eliminated. Combined with the pump is a pressure-regulating valve which opens a return passage to the suction side when the pressure exceeds the limit for which the valve is set. Another feature is a special cut-out valve which permits of using the same fuel conduits for the hand pump when starting.

The Siemens & Halske Co. always has specialized in air-cooled airplane engines of the radial type, and numerous engines of its make are in use in Germany on school and sport planes. It produces a large number of models and many parts are interchangeable between



several of them. The feature of Siemens engines is the special construction of the cylinders, which consist of a finished steel sleeve with bottom flange which is screwed into an aluminum cylinder casting after the latter has been heated. The combustion chamber is of hemispherical form and the valves are inclined in the head. The compression ratio of these engines is 5.8 to 1, and they have been built in five, seven and nine-cylinder types, as well as in a three-cylinder and a rotary type. The company acquired manufacturing rights for the Bristol Jupiter engines from the French



*Daimler-Benz 12-cylinder, 1000-hp. motor*

Gnome-Rhone Co., but it appears that this was not put in production, and it is already experimenting with two new very large radial engines based on its own experience and which are designed for an output of 700 hp.

The Daimler-Benz Co. came to the show with a powerful water-cooled 12-cylinder V-engine. It is a remarkably compact design, and the makers claim it has an output of 1000 hp. when using the supercharger. The bore is 6.49 and the stroke 8.26 in., making a total piston displacement of 3288 cu. in. It is the largest water-cooled engine built in Germany. The six cylinders of each bank have a common aluminum cover which completely incloses the valve gear. There are four valves per cylinder, operated by an overhead camshaft, which is driven by an inclined shaft from an auxiliary driveshaft at the rear. This latter shaft drives a Bosch magneto and a 200-watt generator, the magneto being at its rear and the generator at its forward end (in the V). Current is used for lighting as well as for the coil ignition system provided. The engine is provided with an Eclipse starter but may also be had with fittings for air starting. The crankshaft main and crankpin bearings are of the roller type. Four floatless carburetors are employed, and their arrangement is peculiar. They are located between the cylinder banks and are accessible only from the top, where there is a sort of scoop with an opening turned toward the pilot. The jets may be attended to through this opening without great inconvenience. The scoop is intended to protrude above the engine hood and to act as a sort of

safety valve in case the engine backfires. The carburetors are fed by two independent fuel pumps, one of which will do the work alone in case the other fails. Each row of cylinders has its own water pump, these pumps being operated by a transverse shaft. Lubrication is effected by one pressure and two suction pumps. Although this is a relatively slow-speed engine (1500 to 1600 r.p.m.), it is provided with a spur reduction gear with a reduction ratio of 1.96 to 1. When operating with a supercharger the maximum engine speed is 1700 r.p.m. Complete with supercharger, generator, starter, reduction gear, etc., but without hub, the engine weighs 1807 lb.

In addition to this engine the Daimler-Benz works also produces a new small air-cooled radial engine developing 30 hp., as a companion model to its two-cylinder engine of that type.

### 12-Cylinder Argus Models

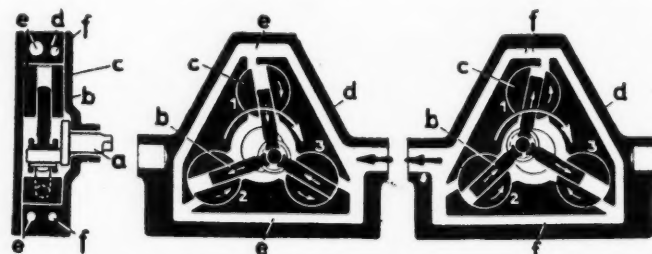
The Argus Co. (which, by the way, is now a subsidiary of the Horch automobile works) has developed two 12-cylinder V-models, one upright and the other inverted. Special interest attaches to the inverted engine. All the auxiliaries are so arranged that they will not add to the air resistance materially, yet they are quite accessible. There is a clear passage between the cylinder banks. The bore is 6.49 and the stroke 7.08 in., the piston displacement being 2819 cu. in. The cylinders are of steel, and those in each bank have a common aluminum head and four valves per cylinder. The overhead camshaft is wholly inclosed and driven through an inclosed intermediate shaft and bevel gears. The camshaft runs in eight babbitted main bearings. As the two Sum carburetors are placed at the rear end of the engine, where they are as accessible as the two magnetos which are mounted across the rear end of the crankcase, the inlet pipe for each bank of cylinders is rather long, and to overcome any difficulties from this cause a simple turbo-blower is installed. Part of the air required by the carburetors is sucked in through the crankcase, where it cools the main bearings.

The other Argus engine is the same in all main details, except that the carburetors, which in this case are Zeniths, are located between the cylinder banks and the blower is dispensed with. The normal output of both engines is given as 700 hp. The Argus Co. also produces a supercharger of the Roots type for the market. It delivers 1.65 lb. of air per second and weighs 106 lb.

There was also one of the new Maybach airship engines (as fitted to the Graf Zeppelin) at the show.

The non-German exhibitors of engines were quite numerous, including Armstrong-Siddeley, Napier, Rolls-Royce, Bristol, Isotta-Fraschini, Farman, Renault, Gnome-Rhone, Hispano-Suiza, Lorraine, Salmson, ADC, Skoda, Walter and others.

A very interesting exhibit was the new 100 hp. Isotta-Fraschini with three banks of six cylinders each, the

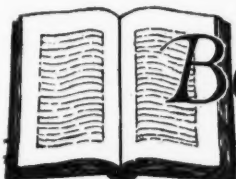


*Junkers triple-plunger fuel pump (a, crankshaft; b, plunger; c, cylinder; d, pump housing; e, suction pipe; f, delivery pipe)*



banks making an angle of 40 deg. with one another. The bore is 5.9 in. and the stroke 7.08 in. A compression ratio of 5.3 to 1 is used, and a reduction gear is dispensed with. At the normal speed of 1600 r.p.m. the engine develops 900 hp., but the speed may safely be increased to 1700 r.p.m., the output then rising to 1000 hp., which figure is guaranteed by the makers. A difficulty with W-type engines is to find room for the carburetors and still have them accessible. In the "Asso 1000" (as the new Isotta engine is known) all of the six Zenith carburetors are arranged on the out-

side cylinder banks, thus leaving the space between cylinder banks free, except for pipes and cables. Each cylinder has four valves and each line of cylinders has two overhead camshafts, which can be adjusted separately and independently of one another. Dual magneto ignition is employed. The crankshaft has eight babbitted main bearings. Each cylinder block consists of six separate steel cylinders with welded-on water jackets, these being joined at the top by a common aluminum head carrying the valve gear and the gas ducts.



## Books for the Business Bookshelf

### *Practical Flying*

Byron Q. Jones, The Ronald Press Co., New York. 210 pp. \$3.

**T**HIS book is, primarily, a training manual for airplane pilots but in addition it is so written that it provides an excellent treatise on the general principles of aircraft operation which will give those who have never even left the ground a good idea of what is required in a good pilot and will suggest their own adaptability for such work. The first few chapters take up the personal qualifications of a pilot both as to physical and mental characteristics. Later chapters discuss, frequently by the Socratic method, all the finer points involved in the successful manipulation of an airplane. The author, who was chief of army aviation training during the War, is well fitted for the task he has undertaken.

### *Labor Management*

Gordon S. Watkins, A. W. Shaw Co., Chicago. 726 pp.

**T**HIS book purposes to analyze the problems of human relations in industry and to present those principles and practices which have proved essential to successful management of employees. It is modern in its outlook and should provide food for thought not only for students and personnel directors, for whom it is primarily written, but also for employers and general readers who are interested in learning more about how the extremely important problem of labor management should be handled. The various subject headings under which the material is presented include psychological aspects of the problem; structure and functions of the personnel organization; problems and methods of recruitment, selection and placement; problems and methods of maintenance and industrial government.

### *Economics—Principles and Interpretations*

Roy Emerson Curtis, A. W. Shaw Co., Chicago. 879 pp.

**T**HIS book represents an attempt to bring classical economic theories in line with actualities of the present day. The author does not evolve any revolutionary ideas but simply interprets our economic life in terms of classical theories, altering or discarding these as necessity requires. The book is written for everyone or, as the author says in his preface, for "... all members of economic society who are disposed to be students and for all students who regard themselves as members of economic society." No previous knowledge of economics, save that which is picked up through casual observation, is required as a preliminary to reading this book since all the fundamental economic principles are outlined. The book is divided into several

major parts which discuss in turn production, consumption, markets and price, money and credit, finance, commerce, risk, distribution, personnel and reorganization. Among these sections nearly everyone will find information of particular interest and value.

### *A. S. S. T. Handbook, 1929 Edition*

American Society for Steel Treating, Cleveland, Ohio. \$7.50.

**F**OR the first time this handbook is provided in a bound edition, previous editions having been in loose-leaf form with additional leaflets being furnished from time to time. The present volume represents nearly a five years' accumulation of material and so provides a very complete source of reference on all matters pertaining to the manufacture and heat treatment of metals. All the standard recommended practices of the A.S.S.T. are included in the book, as well as a large amount of miscellaneous material concerning the interests of members of the society.

### *Steel and Its Treatment*

John F. Keller, American Society for Steel Treating, Cleveland, Ohio. 267 pp. illus. \$3.50.

**T**HIS volume contains the six-lecture course given by Prof. Keller of Purdue University to industrial men of Indiana and which during the last two years has been given on a national scale through the combined auspices of the University and the A.S.S.T. The book is written for the engineer and others who must work with steel but have had no metallurgical training. It is intended to bridge the gap between no knowledge or only a hazy knowledge of the fundamentals of metallurgy and the point where a man can read the more technical literature intelligently.

### *Capital Stock Without Par Value*

John R. Wildman and Weldon Powell, A. W. Shaw Co., Chicago. 533 pp.

**S**INCE capital stock without par value is largely a matter of law and accounting, with the laws being made by legislators not usually understanding their accounting significance and application, a great deal of confusion has arisen in the interpretation of balance sheets which have been designed to fit legal requirements rather than to portray accurately the condition of the business. As an attempt to improve this condition the present volume has been prepared and is intended to give a logical exposition of the entire subject. Both the legal and accounting principles underlying the use of capital stock with no par value are considered and the information presented should go far in making future balance sheets more clearly indicative of conditions than many are at present.

# Rivets Used *in Lieu of* Fixtures *or* Jigs for Locating Welded Parts

Weld is depended on entirely for strength required, says  
Budd executive in describing operations on bodies.  
Spot and flash processes coming to front.

**A**MONG papers presented at the recent meeting of the American Welding Association in Philadelphia was one of direct automobile interest, that on Production Welding in the All-Steel Body Industry, by J. W. Meadowcroft, assistant works manager of the Edward G. Budd Mfg. Co. Mr. Meadowcroft introduced his paper with a brief review of early uses of welding in body manufacture and then went on to an explanation of some of the latest practices in the Budd shops.

The author commented upon the combined use of riveting and welding, explaining that in many cases the rivets are used merely for properly locating the parts to be welded without the use of a welding fixture or jig. The parts are then spot-welded, and the welded joint is depended on for the strength required. In that case the rivet hole or locating hole is punched in the stamping at the time it is pressed out, and the parts

are assembled by means of the rivets, which operation is followed by the welding process.

Mr. Meadowcroft does not look favorably upon the inverse practice of first welding up parts and then reinforcing the welded joints by riveting. The Edward G. Budd Mfg. Co. now makes practically all joints by welding and uses riveting only where customers insist upon it and at points where a sub-assembly, such as doors of all models, rear decks of coupes, roadsters, etc., are seamed to main assemblies and it is considered advisable to have a riveted joint to facilitate replacements.

Records of the company show that the use of arc welding in its operations decreased from 5 per cent in 1914 to 1.2 per cent in 1928; during the same period the use of oxy-acetylene welding decreased from 48 to 30.3 per cent, whereas the use of spot welding increased from 47 to 68.5 per cent, the latter figure,

however, including flash welding.

Following are some excerpts from Mr. Meadowcroft's paper which deal with various processes and equipment used in the Budd plant:

Fig. 1 shows a method of spot-welding developed for tacking the outside door panel to the inside frame. The entire inner panel is energized, the single electrode or welding die shown furnishing the means of making the weld. This machine, which was designed and built in the Budd plant, is known as the oblique spot welder. The flexible lead energizing the inside panel is of sufficient size to carry the ampere load, and sufficiently flexible to permit of welding the entire door with one handling. The flexible

Fig. 1 (right)—Special spot welding machine developed for tacking outside door panel to inside frame



Fig. 2 (left)—Flash welding machine for welding two-piece cowls and roof panel joints





Fig. 3—Special design portable spot welding machine does away with toggle clamps

joint between the cross bar and flexible lead is water-jacketed and of such construction that the weight of the unit makes a practically perfect contact. This machine is entirely foot-controlled.

Fig. 2 shows the flash welding of the metal roof

panel to the upper quarter panel of a standard "all-steel" coupe body. The welding machine is of a standard design and is used in the flash welding of all two-piece cowls of earlier design, and all roof panel joints on the newer closed bodies. The machine in this case is power-driven and fully automatic and it has a capacity of 125 kw.

Fig. 3 is a view from a modern spot-welding assembly line, on the production of front ends for a popular make of passenger car. The front end in this case is standard on four models, viz., coupe, sedan, cabriolet and delivery. In the production of a unit of this size many difficulties have been encountered, but these were completely overcome by the use of a manually operated welding conveyor.

#### Front End Assembly Jig

The most important operation of the front end assembly line is the proper locating of the partly assembled outside shell to the interior frame work. This is accomplished very successfully by the assembly jig shown in Fig. 3. A few spot welds are placed at fixed points by each operator and the piece is removed.

Fig. 4 shows the front end unit passing through a number of operations on the high-production side of the conveyor. The length of track on this production side is 296 ft. and accommodates 19 standard upright welding machines. Fig. 5 shows the flexibility of the hanger and the ease of operation, as a single operator is handling the unit in this difficult position. Fig. 6 is a close-up view, showing the method of operating the welding machine, leaving both hands of the operator free.

Measures employed in overcoming various difficulties encountered in connection with the welding line, and some of its features are dealt with in the following summary:

1. A sufficient number of machines were provided on the conveyor to permit of splitting up operations where required in order to equalize the work of different operators.
2. The parts are carried along on hangers of great flexibility that permit of their being swung into any position desired; if it was found impossible to attain the

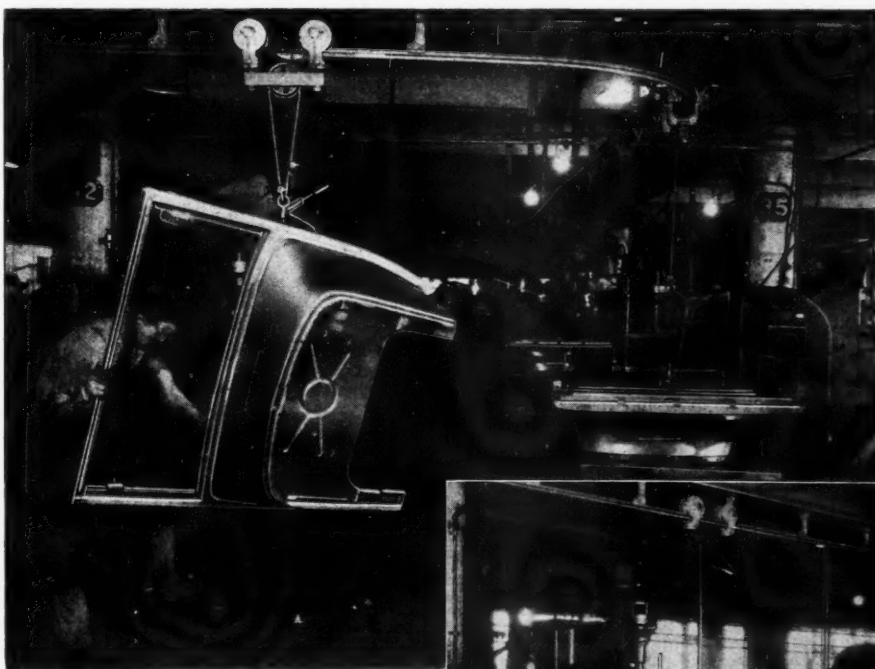


Fig. 5 (above)—Illustrating jig flexibility

Fig. 4—Welding line for front end assemblies





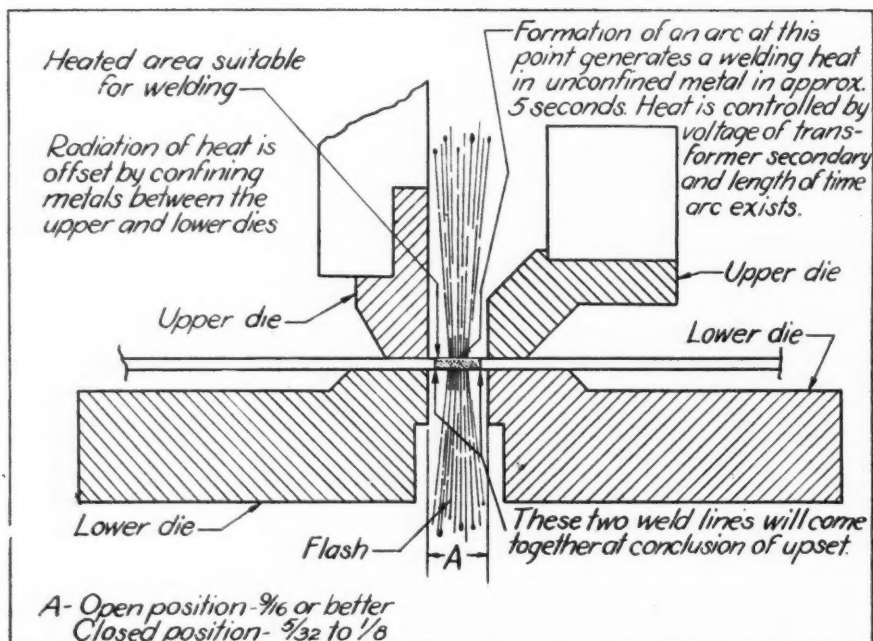


Fig. 7—Illustrating the theory of flash welding

most desirable position for any machine, that machine was redesigned.

3. Where necessary, space for a setter-up is provided between adjacent machines. This man jigs the part, and the jig is returned to him by the operator. Enough jigs are provided to make this method of assembly possible.

4. Floor space on large runs is reduced to a minimum, as there is no bank of material between machines.

5. If parts were to be moved from machine to machine by trucking and similar conveyor methods their outside finish after they had passed through 27 operations would be greatly impaired and they would require straightening and refinishing.



Fig. 6—Close-up view of welding operation

6. A double line is used, one line being manned with what is referred to as a skeleton crew, from which skilled hands are drawn to keep the main line constantly in full operation.

In Fig. 7, Mr. Meadowcroft explains his theory of the flash weld.

In the operation of the flash-welder a perfect fit must exist between the upper and lower dies at all times, while the lower dies, connected directly to the transformer terminals, must be kept in perfect alignment. This point is absolutely essential or the finish of the piece will greatly reduce the strength at the flash welded section. With the metal clamped in perfect alignment and extending beyond the dies  $\frac{1}{4}$  in. to  $\frac{9}{32}$  in. on each piece, the current is applied before the edges of the metals come into contact, the voltage of the transformer being higher than that used in the butt welder. As the edges of the metal

come into contact an arc is drawn, setting up a decided flash.

The speed of the machine and the voltage of the transformer secondary are so adjusted that by the time the machine has reached the high point on the operating cam the metal remaining is in a plastic state and ready for welding. At this point the power is cut off from the transformer and the actual welding operation is performed.

The amount of metal extending beyond the welding dies being the factor governing the character of the finished weld, it is absolutely necessary that the same amount of metal extend beyond both lower dies.

Welds on the outside shell of automobile bodies must be sound and free from defects after being finished, and the strength of such welds must be beyond question.

## Annual Production Number Next Week

**N**EXT WEEK, Nov. 17, *Automotive Industries* will publish its annual Production and Factory Equipment Issue, devoted exclusively to the discussion of timely automotive production subjects.

Twice the usual number of editorial pages will be given over to specially prepared and liberally illustrated articles dealing with matters upon which production men of the industry are now focusing their attention.

While the material of course has been edited chiefly for production men, all automotive executives will find in it much that is of interest and value to them.

# Just Among Ourselves

## An Election That Didn't Upset Business

WITH election day at hand as we write, it is safe to say that 1928 has finally, and we hope permanently, disposed of the ancient myth that business is prone to be poor or at least hesitant in a presidential year. The hotter the campaign got this year, the more emphatically did the automotive industry continue to break records in production and sales. And we believe firmly that business in general and automotive business in particular is going to continue reasonably good for the rest of 1928 and excellent for the year 1929.

\* \* \*

## Situation Full of Optimism

HOW can one come to any other conclusion at the moment? Passenger car production is relatively high for this time of year, sales are good and new car stocks are low—an unusual prosperity combination in the car side of the business. Replacement parts manufacturers for the most part are almost bubbling with optimism, as indicated by the opinions of many executives of such organizations whom we talked with at the recent A.E.A. and N.S.P.A. shows in Chicago and Cleveland respectively. Makers of parts for original equipment mostly have a pleased smile these days because there is noticeable a distinct trend on the part of vehicle makers to buy more parts from outside independent sources. Pollyanna platitudes don't make exciting copy for the business paper journalist, but we aren't interested in merely looking for trouble. A completely optimistic picture is the only one which we can paint

honestly at the moment after nearly two months of contacting men in every phase of automotive manufacturing and distributing. Something may happen to change that picture, but right now the horizon seems clear.

\* \* \*

## Another Sign of Stability

FEWER passenger car names seem destined to pass into the discard in 1928 than in any single year for some time back. Perhaps we may properly regard this lessening of the death rate among car manufacturers as another of the numerous manifestations of growing stability in the automotive industry. True, there have been several companies which are known to have tottered during the year, but at least one of these now seems definitely back on the way to success. Checking over the list, it would appear that the 1929 car roster will contain the same names as the 1928 list with the probable exception of McFarlan, while at least one new name by an old manufacturer will come in to replace it. At most there will not be more than two or three 1928 passenger car names missing from the 1929 roster.

\* \* \*

## Industrial Disputes Small Factor in Unemployment

BEING specially interested at the moment in the matter of stabilization of employment, we looked with particular interest at the chapter on "Regularizing Employment" in G. S. Watkins' new book called "Labor Management." It appealed to us as a good, sound chapter of the text book type, based, as it was, on the theory that "Stabilization of production and regular-

ization of employment must be accepted as a major responsibility of modern industrial management and an essential phase of enlightened personnel procedure." One interesting statement Watkins makes concerning a point which perhaps needs emphasis. Industrial disputes, he says, are often assigned an important place as a cause of unemployment, but as a matter of fact "labor troubles are a relatively insignificant factor in irregular employment, being responsible for not more than 1 or 2 per cent of the total number of working days lost annually by American wage earners."

\* \* \*

## Story With a Moral for Business Men

HEARD a true story today of a woman confined to an insane asylum who, when she went in, took a very careful inventory of all of the furnishings, fixtures and objects in her room and in her wing of the building. A bit later a new runner carpet was laid in the hall. She refused to walk on it, insisting on jumping over it every time it became necessary for her to cross it. Questioned, her only reason was "It wasn't here when I came." While the reason seemed inadequate to the sane attendants and doctors, the lady in question was none the less adamant in her decision. So far as we know she still is jumping across the carpet. What's that got to do with automotive manufacturing and marketing? you ask. Well, maybe nothing . . . but it isn't a bad idea for all of us to give ourselves a checking over once in a while to make sure that in our business life we are not developing into carpet jumpers. —N.G.S.

# Engine *Detonation* Attributed to Attained *by* Residual Un

By R. N. Janeway

*Turbulence also a factor but  
change in combustion cham-  
ber shape is not regarded  
as a remedy.*

**T**HIS is the second of two articles in which the author analyzes the factors affecting detonation.

The first article appeared in last week's issue (Nov. 3).

**T**HE points discussed in the first part of this article (last week's issue), may be summarized as follows:

1. The primary factor governing detonation is the

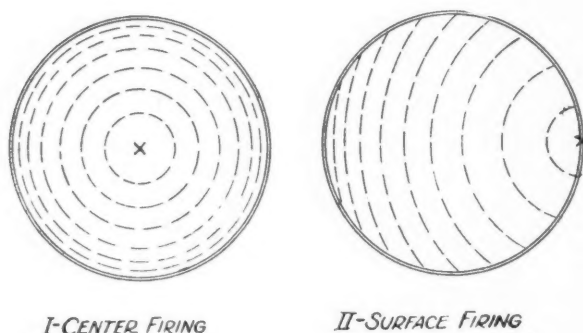


Fig. 6—Flame propagation in a spherical chamber

temperature attained by the residual unburnt gas toward the end of combustion. This depends upon the initial temperature of the charge, the maximum pressure of combustion and the degree of cooling to which the unburnt gas is subjected during combustion. All the factors in engine operation which are known to affect detonation can be accounted for on this basis.

2. Turbulence does affect detonation tendency, but in relatively minor degree, and it is not probable that change in combustion chamber shape can influence turbulence sufficiently to cause a change in detonation tendency.

This summary leads to the unavoidable conclusion that the influence of the combustion chamber on detonation lies in the intensity of cooling which it exerts on the unburnt gas during combustion. With this fundamental to work with, not only do the observed effects of combustion chamber form on detonation become explainable, but the way toward improvement is clearly defined.

As an illustration of the effect of chamber form on heat transfer from the unburnt gas, consider a combustion chamber of spherical form. This type, although hypothetical, has always been held up as an academic ideal on the ground that it provides the minimum surface-to-volume ratio, and hence the highest efficiency due to minimum heat loss. While this is true, the real

merit of such a chamber lies in the high surface-to-volume ratio on the unburnt gas when ignition is at the center of the sphere. Diagram 1, Fig. 6, shows how the surface-to-volume ratio on the unburnt gas increases as the flame spreads out equally in all directions. In fact, in this case the entire surface is in contact only with unburnt gas throughout the combustion. At the end of combustion the residual gas lies in a thin film adjacent to the wall and the surface-to-volume ratio approaches infinity. This is truly ideal from the detonation standpoint. Now consider the same chamber fired from a point on the wall (Diagram 2). In this case the cooling effect of the wall is divided between the burnt and unburnt gas during combustion, and as the flame approaches the end of its travel, the surface-to-volume ratio for the unburnt gas approaches zero instead of infinity. The wrong firing position thus obviates the entire advantage of the chamber form.

To go now from the hypothetical to the practical, let us compare former L-head chamber practice with present-day representative design and see wherein lies the fundamental improvement from the detonation standpoint. In Fig. 7, Diagram 1 shows a chamber of uniform height over its entire length, with the firing point located at the valve end. It will be seen that at no time during the flame spread is the unburnt gas subjected to a cooling effect of any magnitude. Diagram 2 represents a typical offset head with the piston approaching the flat of the head to within a close clearance and the firing point located in the same place as in Diagram 1. Here we see that the last gas to burn is located in a narrow pocket of very high surface-to-

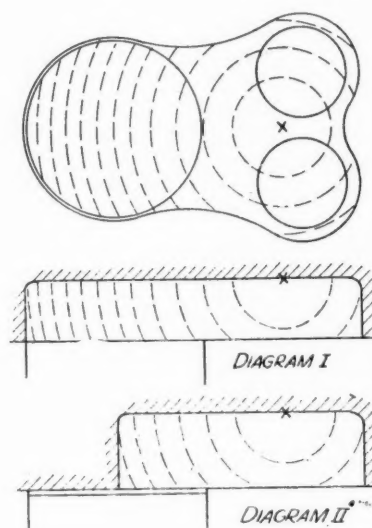


Fig. 7—Effect of offsetting chamber



# High Temperature burnt Gas

volume ratio, with consequently great cooling effect, which increases throughout the period of combustion as more and more gas is compressed into the clearance space from the main chamber. It is obvious that there is a much greater cooling effect at the vital point in this case than in the case of Diagram 1. This is without question the fundamental reason for the advantage of the offset head.

If it be true that the narrow clearance space in the offset head is responsible for the advantage of the latter, then the detonation tendency should vary with the height of the space. Fig. 8 shows the results of tests on a series of chambers identical in all respects save the height of clearance between piston and head at top center, which was varied from 1/32 in. to 1/4 in. in steps of 1/32 in. The tests were made on a single-cylinder engine, and detonation was very carefully measured in two independent ways, namely, by retarding the spark for "no knock" and by means of a special detonation indicator. The curves of Fig. 8 show that as the clearance was increased, detonation intensity increased progressively, with the exception of the step from 1/16 in. to 3/32 in. where no difference was detectable. The form of head was a typical offset design covering more than half the piston area. These results

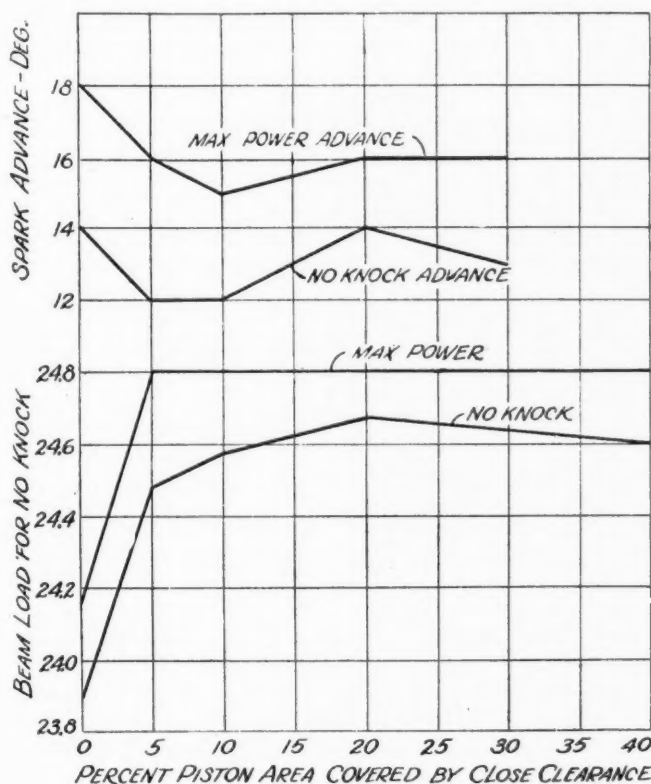


Fig. 9—Effect of varying extent of close clearance area. (Compression ratio, 4.80 for 5 to 40 per cent covered, 4.38 for 0 per cent covered; plug at center of volume in each case. Tests made at 1000 r.p.m. under full load)

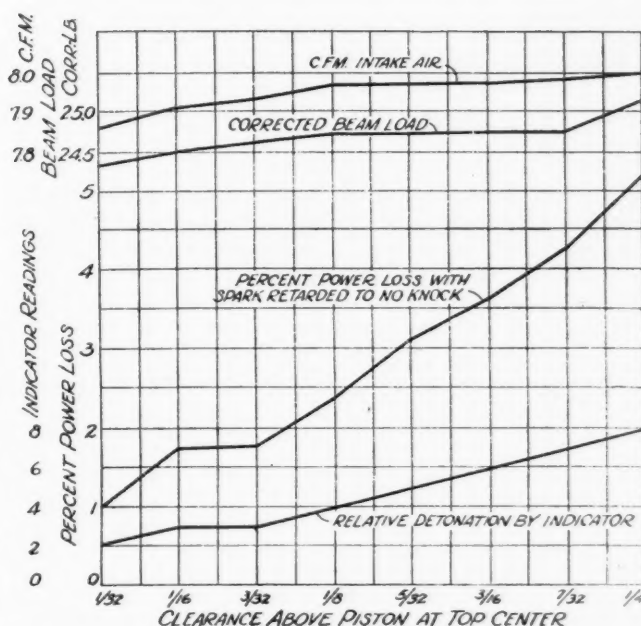


Fig. 8—Effect of varying clearance in offset chamber. (At 1000 r.p.m. under dull load with constant compression ratio)

corroborate the contention that the merit of the offset type chamber lies primarily in the cooling effect of the narrow clearance space; and at the same time add proof that the temperature of the last gas to burn is the fundamental factor governing detonation.

In this connection it is also important to note the variation in power with change in clearance. Fig. 8 shows that not only was there no loss in power with increasing clearance but actually an increase due to improved volumetric efficiency. It would not be safe to generalize from this that volumetric efficiency will always be improved by increased clearance. It is probable that in this case, with considerable restriction between chamber and cylinder, the increased clearance reduced the resistance to flow. The significant thing is that the absence of power loss with greater clearance indicates that the gas in the clearance space burns normally and is strictly a part of the combustion chamber. Considering that the piston usually travels from 3/32 in. to 1/8 in. from top center before combustion is complete, and that the density of the gas compressed into the space is tremendously increased during combustion in the main chamber, at least one-tenth of the total charge is ordinarily contained in the clearance space when the flame reaches it. If burning were suppressed due to the high cooling effect, the loss even with minimum clearance would be considerable.

## No Advantage in Minimum Clearance

The practical conclusion from these results is that there is no advantage in cutting the clearance to the absolute minimum. As the curves of Fig. 8 show, the detonation increase from 1/16 in. to 1/8 in. clearance is very slight and actually is the same at 3/32 in. as at 1/16 in. which may be considered the absolute practical minimum.

Another important design factor is the horizontal extent of the clearance space. Since detonation is limited by the maximum temperature to which the unburned gas is compressed, the intensity of cooling of the very last gas to burn, rather than the quantity cooled, is the important consideration. It is essential merely that sufficient gas be compressed into the clearance space to prevent the critical pressure and temperature from

being reached in the main chamber. Fig. 9 shows the results of single cylinder engine tests on a series of heads with varying extent of clearance from zero to 40 per cent of piston area. The heads were similar in form and compression ratio, with the exception that the head without any close clearance had to be run at 0.4 lower compression ratio. In each case the plug was located at the approximate center of volume of the main chamber. The curve of Fig. 9 shows the variation in beam load with spark retarded for "no knock," with varying extent of close clearance. It will be seen that by far the greatest change took place between zero and 5 per cent piston coverage, indicating the effectiveness of the clearance space even when it contains just the very last bit of the gas to burn. As the extent of the clearance space was increased the detonation was somewhat reduced, up to 20 per cent piston coverage, but further increase in extent resulted in a slight tendency to increase detonation. From 10 per cent to 40 per cent piston coverage it is apparent that the detonation is very little affected. This bears out the contention stated above that the intensity of cooling of the last gas to burn rather than the quantity cooled is the vital factor in detonation.

#### No Effect on Turbulence

These results are of additional significance in that, although the communicating area between chamber and cylinder was considerably changed in this series of heads, there was no evidence of any effect on turbulence. Detonation tendency did not follow decrease in communicating area, nor was there any reduction in required spark advance between 5 per cent and 40 per cent piston coverage to indicate speeding up of combustion. It appears, then, that combustion chamber form, within considerable limits, has no influence on the effective turbulence.

While the cooling effect of pocketing the last gas to burn in the narrow clearance space is the primary advantage of the offset-type chamber, the form of the main chamber and the plug location have important effects on detonation tendency. This also resolves itself into a matter of heat transfer from the unburnt gas. As burning proceeds and the pressure increases, the tendency for the pressure to equalize itself throughout the chamber sets up a flow of unburnt gas ahead of the flame front. In this way unburnt gas is continually being compressed from the main chamber into the clearance space as the flame advances. The extent to which

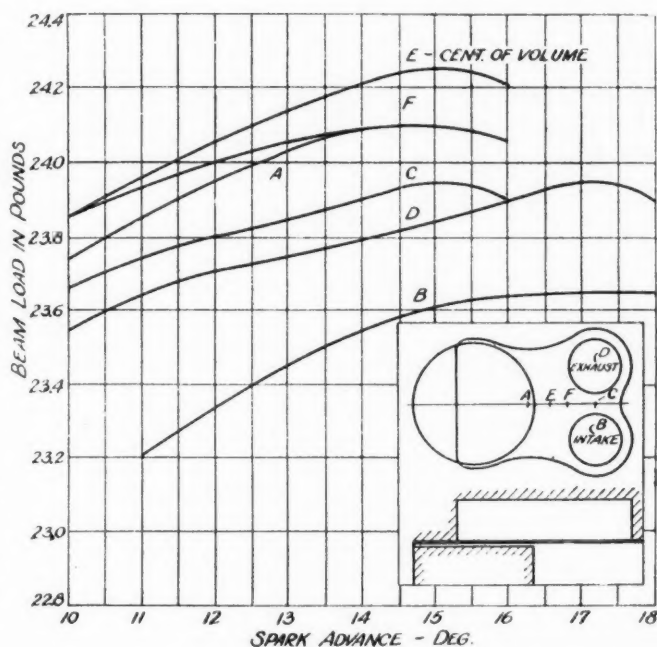


Fig. 10—Effect of spark plug location. (Tests at 1000 r.p.m. under full load on a single-cylinder 3½ by 4 in. engine, with a compression ratio of 4.84:1)

the gas is cooled in the main chamber is bound to offset the resultant temperature of the gas in the clearance space.

As explained above, in the illustration of the spherical combustion chamber, when contrasting center firing with surface firing, one effect of plug location is its influence on the ratio of wall surface to volume of contacting unburnt gas. This accounts for the advantage usually found in firing from the center of volume. Fig. 10 shows representative spark curves for an offset chamber on a single cylinder 3½ by 4 in. engine with various firing positions, as indicated in the sketch in the same figure. It will be seen that the center of volume position, E, is the best from the detonation and power standpoints. Nevertheless, as the plug is moved back toward the valves, at F and C, the loss in maximum torque and in torque for "no knock" is only about 1 per cent. Comparing the firing positions B and D over the intake and exhaust valves respectively, B is decidedly inferior as to both maximum torque and torque for "no knock." These tests therefore indicate that firing

over the intake valve is inferior to firing over the exhaust. Owing to the high temperature of the exhaust valve, it is desirable to burn the gas surrounding it at the beginning. By firing over the intake valve, a considerable quantity of unburnt gas is swept over the exhaust valve, picking up heat from it and raising the resultant temperature of the residual unburnt gas

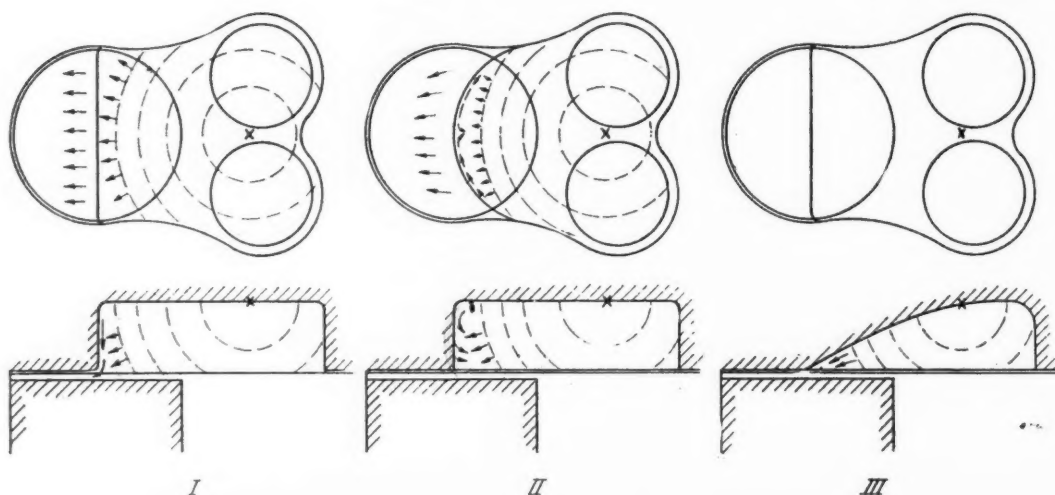


Fig. 11—Effect of end wall shape on unburnt gas flow



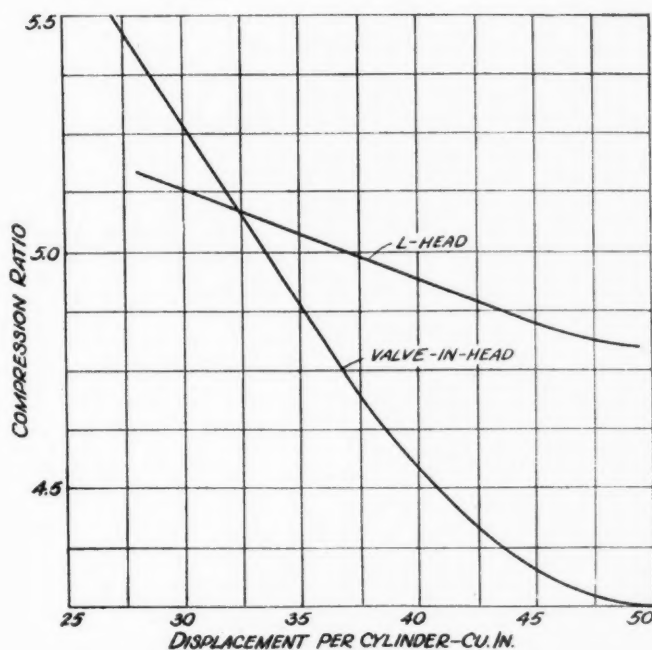


Fig. 13—Effect of cylinder size on limiting compression ratio. (From specifications of representative 1928 models)

at the end of combustion. For this reason it is advantageous to favor the exhaust valve when the plug is located off the center line of the chamber.

Position A, which is on the piston side of the center of volume, is of interest in that it shows the disadvantage of burning in the clearance space before combustion in the main chamber is complete. With this position the flame travel is the same to the valve end of the chamber and to the end of the clearance space. Under this condition it is possible for detonation to occur in the main chamber, since the gas in the clearance space may not be the last to burn. This, of course, is undesirable, since it prevents the clearance space from being fully effective. If the firing position were located still closer to the piston end of the chamber, detonation would become much worse, since then the gas in the clearance space would be burnt considerably ahead of the end of combustion and the beneficial effect of the clearance space would be entirely nullified.

#### Length of Flame Travel

In this connection it is worth while noting that length of flame travel has no inherent significance, although superficial observation may lead to such conclusion. In the results just discussed, it will be seen that while detonation increased as the firing position was moved back toward the valve end from center of volume, increasing the length of flame travel, it also increased decidedly when the length of travel was reduced by firing at A. Where change in firing position produces an effect upon detonation the answer will invariably be found in the result of that change on heat transfer from the unburnt gas.

From the standpoint of detonation, the main item of importance in the form of the main chamber in the offset type is the shape of the wall adjacent to the clearance space. Its importance is due to its strategic position since it acts as a baffle on all the unburnt gas which is forced from the main chamber into the clearance space. Not only does it direct the flow of this gas, but it also has an opportunity to cool the gas effectively as it impinges upon it. Considering the tremendous velocity of flame propagation, the rate of

displacement of the unburnt gas is proportionally great, and the velocity with which it is made to flow can be used to advantage in increasing the efficiency of heat transfer to the walls.

Where the fluid velocity is high, the most effective disposal of a given surface for heat transfer purposes is normal to the direction of flow. The impact of the fluid on the surface causes an intimacy of contact with all the fluid which most effectively promotes heat transfer. This is illustrated by a condition which the writer found in the course of some bomb experiments. The bomb was electrically heated to a high temperature, the liquid fuel was introduced, and after allowing time for vaporization, the air was forced in under pressure and the charge ignited. The bomb was so designed that the air inlet was directly opposite the flat bottom of the bomb chamber, so that the high velocity air jet entered normal to the hot surface. It was found immediately that with the temperatures required for the experiments, self-ignition occurred simultaneously with admission of the air. Disassembly of the bomb showed a distinct spot opposite the air inlet where ignition apparently had occurred. This difficulty was overcome by merely fitting the air inlet with a nozzle which directed the air jet away from the surface in question. In this case the high velocity air jet impacting upon the hot surface provided so intimate a contact that the mixture at that point must have been almost instantly heated to the temperature of the surface which was in excess of the self-ignition temperature.

This principle indicates that the wall adjacent to the clearance space should be substantially vertical so as to provide a surface upon which the unburnt gas will impact as it flows into the clearance space. It is also essential that this surface be designed to act as a baffle in smoothly directing the flow. To obtain this effect the wall should be plane or convex toward the main chamber. The concave wall tends to produce eddying and to direct the flow back toward the chamber. In

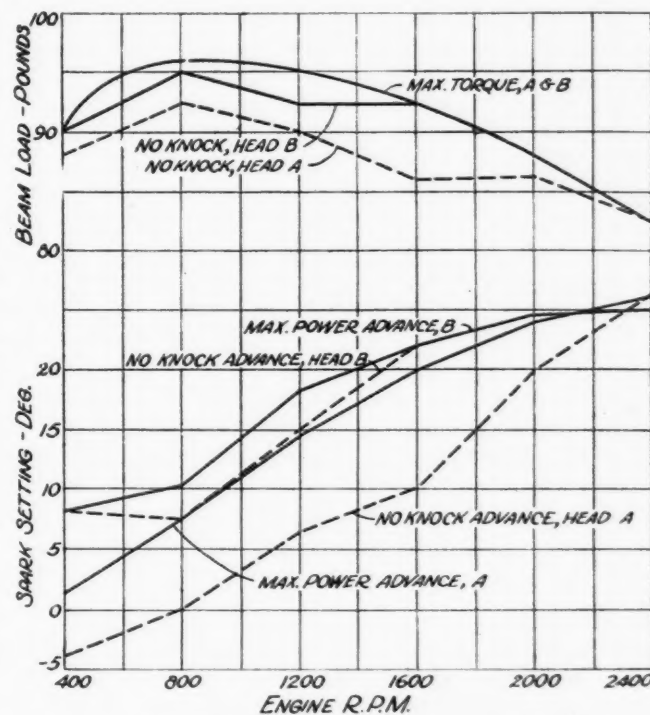


Fig. 12—Comparison of combustion chambers. (Head A a typical streamline design; B, with an impact wall adjacent to the clearance space. Compression ratio 5.25:1 for both A and B. Engine a six-cylinder L-head of 3 1/4 by 4 1/2 in.)

Fig. 11, diagrams 1 and 2, compare the baffling effect of plane and concave walls. The arrows represent the flow of unburnt gas. With the plane or convex wall the gas after impact flows divergently along the wall and into the clearance space. The concave wall sets up a convergent flow along its surface so that instead of being directed into the clearance space, the gas tends to flow back toward the main chamber.

Current practice, which consists almost invariably in laying out the longitudinal section of the chamber as a circular arc, thus falls short of realizing the maximum anti-knock effect. This practice may be due to a belief that such a contour streamlines the flow of incoming charge. In the absence of any rational basis for the detail design of combustion chambers, this has offered a simple enough formula, with the added advantage of being easy to machine. Flow experiments have shown, however, that there is no advantage in this type of chamber from the standpoint of reduced resistance. It certainly does not provide the cooling effect to be obtained from impact, since the gas flow is necessarily tangential rather than normal to the surface, as shown in Fig. 11, diagram 3.

#### Improvement Can be Effectuated

Actual engine results have shown that a marked improvement in anti-knock effect can be secured by correct design of the wall adjacent to the clearance space, along the lines described above. Fig. 12 shows typical comparative torque curves for two heads of the same compression ratio, with torque and spark retard for "no knock" indicated in each case. Head A was of representative streamline design, while head B was of practically uniform height with a vertical plane wall adjacent to the clearance space. It will be seen that whereas the latter had little or no detonation at maximum-power advance over the speed range, head A required considerable retard for "no knock," with a consequent loss of torque varying from 4 to 7 per cent in the range of 800 to 1600 r.p.m.

In overhead valve engines if the valves are arranged side by side, as is usually the case, they circumscribe the chamber shape within narrow limits. Plug location is necessarily fixed at the end of the chamber. Center firing is very effective but is obtainable only by flexibility in valve location as by using overhead camshafts. Dual firing does permit of a somewhat higher compression ratio, but the improvement over end firing is about half that obtained by center firing.

The limit of the compression ratio in the usual valve-in-head engine seems to depend very much on the cylinder size. Here it is apparent that the increase in surface-to-volume ratio of the chamber which follows reduction in displacement is operating to produce the improved anti-knock effect. Fig. 13 shows the variation in compression ratio with cylinder size for representative valve-in-head and L-head engines as obtained from 1928 specifications. Over a range of cylinder displacement of from 25 cu. in. to 45 cu. in. the compression ratio shows a variation of 5.5:1 to 4.3:1. In L-head engines, on the other hand, the limiting compression ratio appears to be comparatively independent of cylinder size, the variation in compression ratio over the same range of cylinder size being from 5.2 to 4.8. This is due to the high surface-to-volume ratio provided in the (clearance space of the) offset type chamber which makes the detonation tendency more or less independent of the overall surface-to-volume ratio in the L-head engine.

The exhaust valve is a potent factor in increasing

detonation in the overhead valve type where the firing position is remote from the valve. In that case a considerable part of the unburnt gas is swept across the valve and is subjected to its high heating effect. Special pains should be taken to keep the exhaust valve temperature at a minimum.

Where some leeway is permitted in valve location there is no reason why compression ratios may not be appreciably increased by valve-in-head chamber design which incorporates the fundamentals brought out in this article. The sensitivity of compression ratio to cylinder size indicates the advantage of the eight over the six in the valve-in-head type.

It has been shown that the fundamental factor in the influence of the combustion chamber on detonation is its effect on the temperature of the last gas to burn.

The principal design factors of importance in promoting this cooling of the unburnt gas, and their effects, may be summarized as follows:

1. The most effective means of reducing detonation, in connection with chamber design, is to locate the last gas to burn in a narrow space of high surface-to-volume ratio, as between the piston and head in the offset type. The closeness of the clearance rather than the extent of the space is the vital factor. However, there is no appreciable advantage in reducing this clearance to the absolute minimum;  $3/32$  to  $1/8$  in. gives practically maximum results. Evidence is conclusive that the gas in this space burns normally and is strictly a part of the combustion chamber content.

2. The best plug location for anti-knock effect is at the center of volume, but the loss involved in moving the plug back toward the valves need not be great. It is desirable from every standpoint to favor the exhaust valve rather than the intake in locating the plug. The firing position should never be on the piston side of the center of volume in an offset chamber.

3. In the offset type the most important factor in chamber form, from the anti-knock standpoint, is the shape of the wall adjacent to the clearance space. This should be a vertical surface, either plane or convex, in order to ensure the impact of the unburnt gas upon it, and at the same time direct the flow smoothly from the main chamber into the clearance space.

A SYSTEMATIC investigation of the mechanical properties of spring steels is being carried out at the National Physical Laboratory for the Springs Research Committee of the Department of Scientific and Industrial Research (Great Britain). A part of this research relates to the resistance to torsional fatigue, a property of particular importance in connection with internal combustion engine valve springs. The results of this part of the research are given in Special Report No. 9 on Engineering Research of the Department of Scientific and Industrial Research. Copies can be had from the British Library of Information, 5 East Forty-fifth St., New York, at a nominal price.

A NEW "Auto-technical Dictionary" has been published by Richard Carl Schmidt & Co., Berlin W-62. This is a third edition of a publication which made its first appearance nearly 20 years ago and has been brought up to date. Technical terms used in the automobile industry are given in four languages, English, German, French and Italian. In the copy under review the English terms lead and are arranged alphabetically, and the work comprises three other volumes, in each of which one of the other three languages leads. Equivalents in the four languages are given for some 4000 automotive terms.



# Centralized Lubrication Reduces Machine *Maintenance* Cost

*Farval system effects marked saving in several automotive plants. Measures the lubricant, forces it into bearing and shuts off flow automatically. Has four parts.*

A GREAT deal of attention is being given nowadays to the proper lubrication of machine tool equipment and the installation of centralized systems is one of the common means being employed to solve the problem of effective oiling.

A centralized system which is being used in a number of automotive plants with success is the Farval system—formerly known as the Farmer system—which is made by Lubrication Devices, Inc., Battle Creek, Mich.

This system consists essentially of four parts—a valve, a compressor, a reservoir and a gage. A valve is connected to each bearing of a single pipe line and measures the lubricant, forces it into the bearing and shuts off further flow, all with an automatic and positive action.

The compressor, of screw plunger type, is connected to the main supply line and exerts a pressure of over 2000 lb. per sq. in., thus forcing the lubricant, whether oil or grease, through the pipe lines and valves and into the bearings.

The reservoir is of pressed steel and contains the supply of lubricant while the pressure indicating gage is located near the reservoir and also serves to indicate to the operator that all valves are working.

The accompanying photograph illustrates an actual application of this lubrication system and indicates the results which may be obtained from its use—the Farval system installed on an eight-spindle Newton rotary milling machine lubricating 42 different points. From one central gun on the side of the machine these 42 points are lubricated in 1 minute.

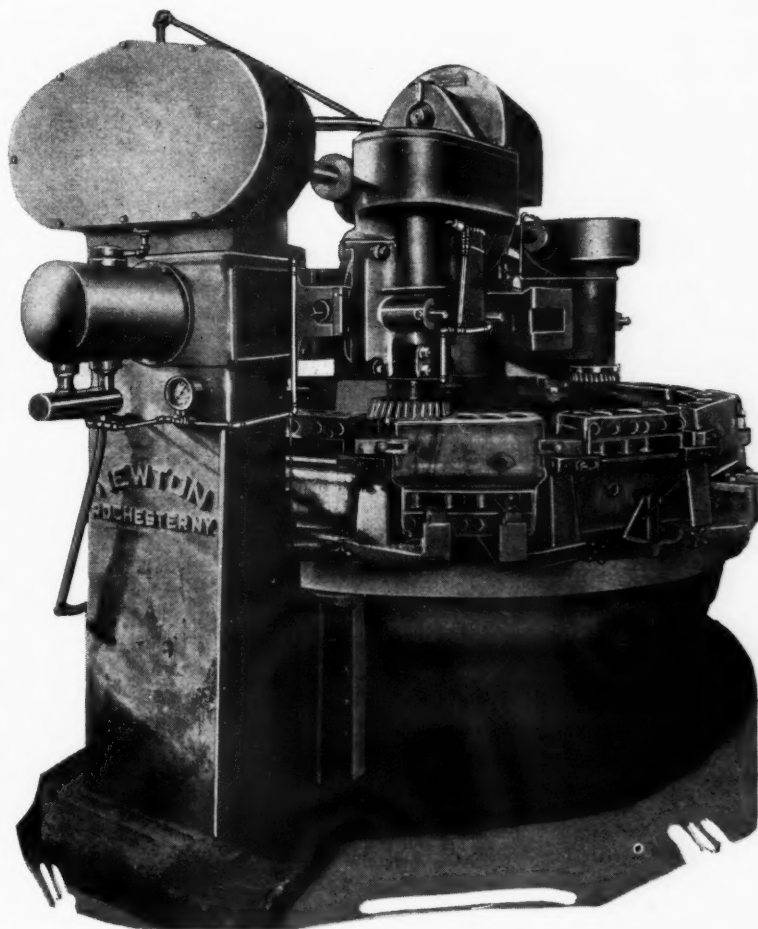
Formerly sight feed oil cups were used and lubricant consumption amounted to 12 gal. of spindle oil per day because of oil running out of the eight vertical spindles. With the Farval system installed, a semi-fluid oil could be used which stays put in the bearings so that consumption was reduced to 6 oz. per day. The cost of the installation was returned in the saving in lubricant in less than three months' time.

## Saves \$100 a Day on Press

In another case a Toledo toggle press was fitted with a Farval system carrying lubricant to 142 points on all bearings, gears, clutches and guides. When grease lubrication was employed it was necessary to shut down the press for 1 hour twice during each 24-hour period to permit a man with a ladder to climb about the machine and screw down grease cups.

The production of the press was valued at \$50 an hour so that the greasing cost alone was \$100 per day.

With the Farval system complete lubrication is obtained in less than a minute and while the machine is in operation. All bearings get a measured quantity of grease under high pressure. This installation paid for itself in one week of increased production. In addition, much less grease was used.



Newton rotary milling machine fitted with Farval centralized lubrication system

A COPY has been received of the fifth edition of Standards of The Hydraulic Society. The Hydraulic Society is a trade association comprising the principal manufacturers of displacement and centrifugal pumps in the United States. The pamphlet contains a large number of data useful in connection with pumping problems.

# THE FORUM

## Says Objectivist *and* Subjectivist Are Not Far Apart

*Difficult to draw any definite line of demarcation between two types. Napoleon is cited as example.*

Editor, AUTOMOTIVE INDUSTRIES:

Although there are but few points in J. D. Mooney's article in your issue of Oct. 13 with which I do not fully concur, nevertheless I do not think it is at all easy to draw any definite line of demarcation between your true objectivist and your avowedly subjective individual. I do not, however, subscribe whole-heartedly to the doctrines of determinism.

Napoleon was sincere in his belief that the empire he was striving to build would provide a genuine panacea for the multitudinous woes from which Europe was suffering at that period. And there were many able contemporaries of Napoleon who shared in this belief—which is tantamount to saying that Napoleon's aims were not entirely selfish and that he was in fact an objectivist working at one time with the full—if fickle—accord of the French nation.

Indeed few dictators displayed such true objective visualization as Napoleon showed when choosing his generals. With but few exceptions, all were picked for their promise of ultimate contribution to the objective—an ideal attainment in present-day scientific management.

And so it was with Caesar, and with Augustus, and with Alexander, right down to the much disputed part played by the German ex-Kaiser in the more recent European "unpleasantness." Each might be termed equally a subjectivist or an objectivist. In fact, we can only differentiate between them by defining objectivism as the aim of the majority and subjectivism as the aim of the minority.

### Artist as an Example

An excellent example of subjective thinking is that of the artist. You may want some advertising work done and you will explain carefully that while beauty of execution, perfection in detail, and harmony in layout may be all-important, immediate aims, they are nevertheless subsidiary to the main objective, which is that of creating a desire for possession in the mind of a certain buying class which lacks that meticulous eye possessed by the true connoisseur of art.

But most men will agree that it is no easy accomplishment to have some artists—however conscientious they may be—divorce themselves wholly from any attempt

to use their work as an immediate vehicle for their self-expression. He is indeed the ideal objectivist artist who can attain such a result—a man dear to the heart of the advertising manager.

The master-craftsman type, familiar in the older countries, is a typical subjectivist. I can recall a blacksmith in a tiny Shropshire village who excelled in ornamental wrought-iron work—work that was beaten out by hand in the form of beautifully perfect flower petals, tree leaves, animal forms, etc., all hammered out on a simple anvil to a thickness—in some places—of less than a sixteenth of an inch.

### Objective Was Immediate

There were but four other men in the kingdom who could produce similar work. But this man's objective was immediate: he liked the work for its own sake: for the pleasure he gleaned from hammering away, hour after hour on an intricate piece of work. He had no desire to divert his talents into other channels—materialistic channels perhaps—but more productive of wealth to himself and of benefits to the rest of the world.

I have seen some old furniture makers, master craftsmen at their game, snort with disgust when asked to work on an intricate pattern for a foundry mould. And I have seen others acquiesce willingly when offered an increased wage. Yet, both types are essentially subjective. The problem before scientific management today is to harness the potentialities of the subjective geniuses higher up the scale—the heads of the "one-man" concern, perhaps. The arrival of the mammoth firm, of big business with its all-embracing sphere of activities, sounded the death knell of many of these one-man concerns—concerns which depended on one man for their supply of motivating force. Scientific business management today must endeavor to attract these subjectivists and attempt to divert their energies along channels less immediately subjective, perhaps, but finally accomplishing their own aims simultaneously with the aims of the objective.

For there is danger in placing too much trust in objectivists. Objectivism implies mass thinking, and mass thinking has not always produced results compatible with a worthy objective.

W. ROPER LINDSAY.



## Oil Engine Efficiencies and Pressures

Editor, AUTOMOTIVE INDUSTRIES:

In your Oct. 13 issue, page 531, a Beardmore compression-ignition engine is credited with 40 per cent thermal efficiency on the brake. Last July Mr. Ricardo was reported to have stated that a Napier (carburetor) engine had attained "39.5 per cent on the net shaft horsepower," and that this was "the highest thermal efficiency yet recorded by any heat engine."

The near approach to equality in heat utilization by these two types of engine suggests some considerations.

One is the possible influence upon the commercial development and respective status of these engines of nearly 100 per cent of the crude becoming available as refined fuel.

Another point is that perhaps a compromise type of engine of a new sort is due in the offing.

And since the foregoing values may perhaps be accepted by some engineers as representative in comparing the possibilities of the compression-ignition engine and the carburetor engine, it should be of interest to have the efficiency of each engine presented with the same mathematical exactness.

It would seem, furthermore, that in order for engineers to visualize and analyze engine information effectively, more care in our engine terminology will be increasingly desirable.

In this last connection the article on page 531 reports some trouble with big-end bearings on the Beardmore high-speed oil engines, commonly referred to as Diesels. Such information is not striking to those who in attempting to obtain fairly authentic indicator cards from high-speed compression-ignition engines have found the value of the maximum pressure frequently evasive. In engineering technical literature, however, a Diesel diagram shows constant-pressure combustion. Engineers becoming newly interested in high-speed oil engines, may, therefore, fail to visualize the possibilities for big-end troubles when reading of high-speed "Diesel" engines, especially when carrying less m.e.p. than many carburetor engines and at much less r.p.m.

If, on the other hand, the terminology for high-speed oil engines pictured an Otto or a Sabathe diagram with a sufficient compression ratio to insure compression-ignition, the deductive mind might more promptly get started on the right tack. Already, now and then, a lot of time is wasted by two persons not looking at the same thing at the same time—one of them being, so to speak, sort of verbally cross-eyed.

ROBERTSON MATTHEWS.

## Decolorizing Earths

IN clarifying lubricating oils use is made of decolorizing earths (Fuller's earth). The action of these earths is not well understood, and some light was thrown on the subject by a communication of M. Valli Douau to the Congress of Industrial Chemistry at Strasbourg recently.

The decolorizing earths consist of hydro-silicates, the proportion of silica in the usable earths varying between 45 and 75 per cent. The chemical constitution, however, is no sure guide to the decolorizing value of any particular adsorbant, and in determining this characteristic one must be guided by other considerations.

The determining cause of the phenomenon must be looked for, as indicated by Langmuir, in manifestations of chemical affinity. The solid surfaces must be considered as made up of atoms whose positions are completely fixed and which create a field of attractive forces. Extraneous molecules when placed in this field are attracted by the surface, which they tend to neutralize, and this neutralization is effective when the layers are of only monomolecular thickness. This phenomenon is accompanied by a liberation of energy, which manifests itself in heating effects.

As concerns the adsorption, the chemical action evidently must be attributed to a magnetic field in which the molecules take up such orientation that the field strength becomes a minimum.

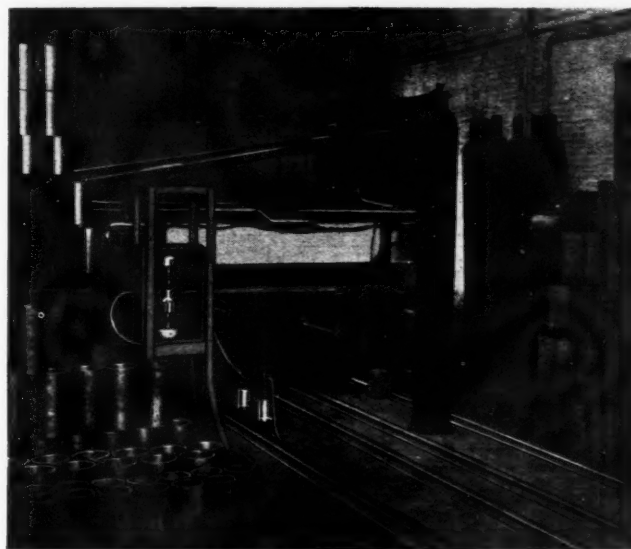
Among organic compounds, those which are adsorbed the most are the ones which develop the greatest chemical affinity. First of all come compounds with multiple bonds; then follow those which, like oxygen, sulphur and nitrogen, have supplementary valencies in the molecule; then the aromatic hydrocarbons, and finally the saturated and naphthenic hydrocarbons. Moreover, for a homologous series, adsorption takes place more readily with the highest members of the group.

These principles permit of explaining what takes place when mineral oils are refined by means of decolorizing earths. The coloring bodies are better adsorbed for several reasons; they have a high molecular weight; many of them are combined with ethylenic radicles, and some of them are acid.

The activation of the earths with hydrochloric acid or sulphuric acid may be explained as follows: When the earths are disaggregated into powder and treated with the acids, they form salts. In dissolving, these salts leave free microscopic channels which increase the surface in enormous proportions.

M. Valli Douau concluded his remarks by pointing out that the clarifying earths may still find numerous new applications and that the industry devoted to them is developing rapidly.

## French Nitriding Plant



THE above is a view of the nitriding plant at the French factory of the Hispano-Suiza Co. An item describing the recent development of the nitriding process in France was published on page 599 of the Oct. 27 issue.

# New Bracke Carburetor Embodies Fuel Feed System

Atomization and lift accomplished by venturi action. Vacuum is sufficient to lift gasoline 36 in. Fuel delivery is controlled entirely by pressure differences.

*By M. Warren Baker*

**A**TOMIZATION and lift by means of venturi action is the principle of the new Bracke Fuel-Lift carburetor which shortly will be in production for original equipment by the Vacturi Carburetor Co., 1253 Diversey Parkway, Chicago.

The Bracke carburetor combines a fuel feed system with a carburetor proper. Sufficient vacuum is set up in the fuel chamber, by the use of a venturi nozzle, to lift gasoline at least 36 in. at all times.

In general design, the new carburetor differs from most others in that it has no float or float mechanism. Fuel delivery is controlled entirely by pressure differ-

ences although an accelerating plunger and an economizer are provided to maintain efficient operation under all conditions.

The body of the carburetor has a main air intake, a mixing chamber and a throttle bore. Communication between the air intake and the mixing chamber is controlled by a spring-balanced air valve 5, the lower end of which is adapted to form an air dash pot 6. The air valve spring is adjusted through the use of a counteracting spring between the air valve body and an adjusting screw 7.

Extending through the side wall of the carburetor and emptying into the mixing chamber, is a venturi tube 20, with such a small admission nozzle that the air valve 5 is held slightly off its seat even at the lowest idling speeds. The throat of the nozzle is drilled for a series of fuel jets, which are in communication with the fuel passageway 21, terminating in a diaphragm chamber 22.

The diaphragm chamber and its cooperating parts take the place of the conventional float and float chamber. The diaphragm itself is of phosphor-bronze, about 0.0045 in. thick, with an outside diameter of 2 3/16 in. and a working diameter of about 2 in.

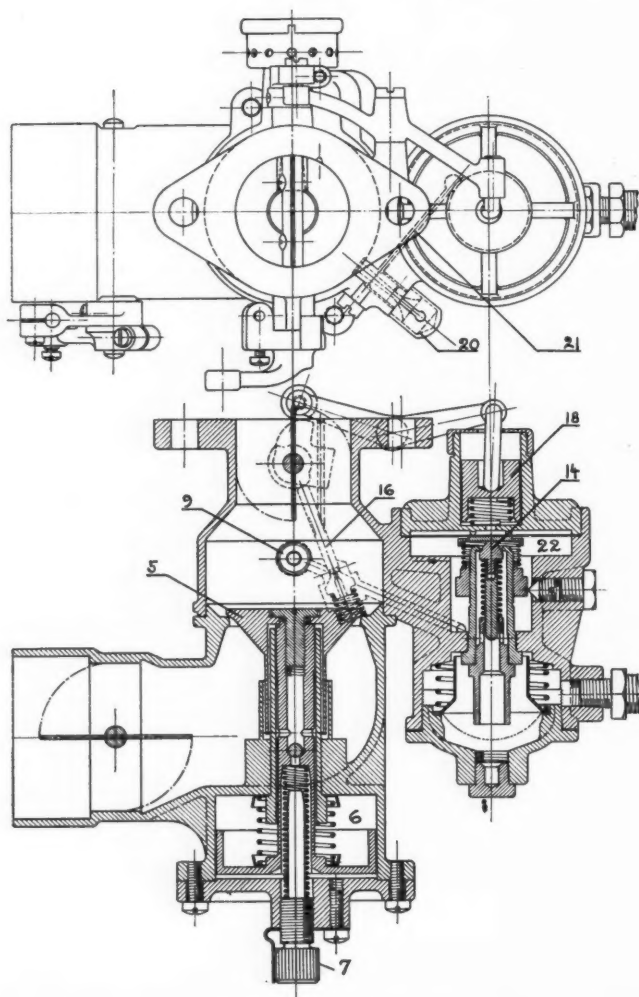
A spring-seated fuel valve 14 has its upper end resting against the bottom side of the metal diaphragm. The upper side of the diaphragm is normally under atmospheric pressure, except under certain conditions which will be discussed further on, so that when pressure on the under side of the diaphragm is lowered, the diaphragm is flexed downwardly, thus opening the fuel valve.

## Principle of Economizer

The carburetor also is provided with an economizer to insure the leanest possible mixture throughout the normal driving range; an accelerating device, a readily adjustable "idler," and a choke to facilitate starting.

The economizer is formed by a throttle operated plunger 16, fitted with a fuel metering orifice, through which all the fuel must pass when the throttle is only partly open. At wide open throttle, this spring-balanced plunger is pushed off its seat by a cam secured to the throttle shaft, allowing a much greater volume of fuel to pass into the venturi throat jets.

Another cam is secured to the throttle shaft to operate an accelerating piston 18, spring balanced, and placed in a small cylinder just above and communicating with the diaphragm chamber. When the throttle is suddenly opened, the piston is depressed, placing a



Plan and vertical section of Bracke carburetor



pressure greater than atmospheric on the upper side of the diaphragm, thus depressing it and allowing a strong "shot" of fuel to enter the mixing chamber.

The diaphragm acts merely as a controlling factor, operating under pressure differences, and in no case does it oscillate, thus obviating crystallization.

Operation of the carburetor is as follows: Assuming the throttle to be wide open, a suction is set up in the mixing chamber. At low speed under wide-open throttle, this suction is equivalent to approximately  $\frac{3}{4}$  in. of mercury. This pressure reduction causes a high velocity air flow through the venturi nozzle and, because of venturi action, the suction of the mixing chamber is multiplied from 12 in. of gasoline to more than 36 in. at the throat of the venturi tube.

This high suction is communicated to the fuel chamber, where it serves not only to flex the diaphragm but also to draw fuel up the line from the tank. The diaphragm and cooperating mechanism are so arranged that a pressure of 36 in. of gasoline column is necessary to open the fuel valve, thus providing a minimum lift of 36 in. at all times and also preventing flooding of the chamber when the car is stopped in a downhill position with the engine not running.

The fuel feed holes in the venturi throat are made large enough not to offer any material restriction to the fuel flow, with the result that the amount of fuel delivered is largely dependent on the depression difference between the diaphragm chamber and the venturi throat. It, therefore, follows that the fuel delivery is regulated by the venturi throat suction, which in turn is controlled by the mixing chamber depression. Since the mixing chamber depression is controlled by the air valve and its parts, calibration of the new carburetor is entirely a matter of regulating the air valve spring.

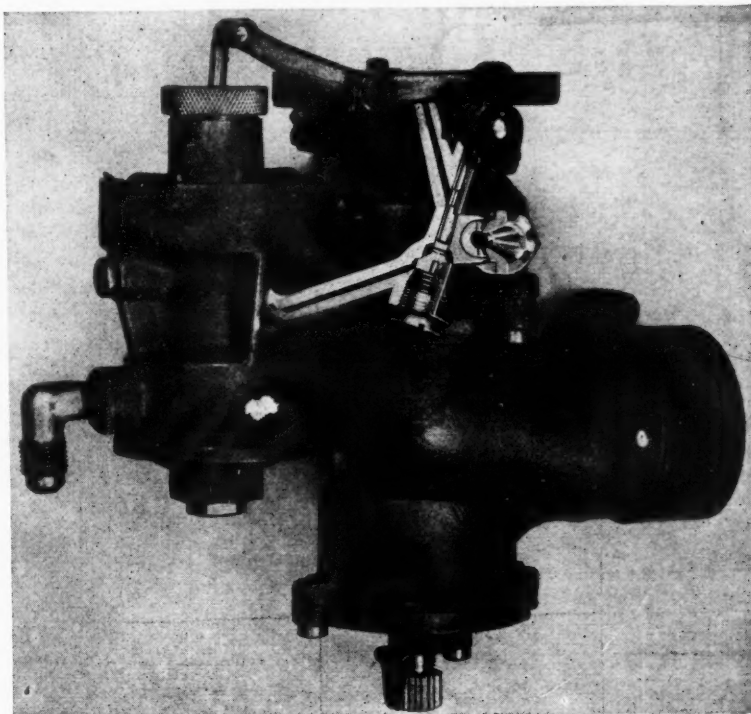
The diaphragm and diaphragm chamber are designed to maintain an almost constant pressure reduction, and tests in the company's laboratories show that with a 2 in. diaphragm and a  $\frac{1}{4}$  in. fuel valve seat, the minimum suction of 36 in. increases to 60 in. at top speed, under wide-open throttle.

It will be seen from this that if, for a given engine demand, a certain prearranged pressure reduction is provided in the fuel chamber, the quantity of fuel delivered to the venturi is constant, regardless of the actual fuel head existing between the tank and the chamber.

If, for example, it be assumed that a 10-in. fuel lift is required under a certain engine-operating condition, the fuel valve assumes a position where a predetermined pressure reduction in the diaphragm chamber is formed. If then the car starts up a hill and the fuel lift increases to 20 in., the suction in the diaphragm chamber increases only slightly, due to the heavier lift demand, in turn causing a greater diaphragm flexure and a greater opening of the fuel valve.

The reverse would be true if the fuel lift were changed to no lift or even to a head. In theory, the mixture is leaner with a heavy fuel lift than with no lift or a head, but tests have shown that practically there is no difference.

Since the fuel lift system is a sealed one, it is necessary that some means be provided to remove any vapor which may form in the fuel line or carburetor



Bracke carburetor, with accelerator fuel passages shown sectioned

when they become warmed. To perform this operation, a second venturi tube is provided, extending through the mixing chamber wall into the atmosphere, with its throat communicating with the upper end of the diaphragm chamber through a restricting orifice.

With a six-cylinder engine of approximately 225 cu. in. displacement, the total movement of the diaphragm is not more than 0.010 in. and this is reached only at top speed under open throttle. The fuel valve is made of stainless steel and its seat of brass. The valve may also be supplied in Monel metal if desired.

The accelerator piston is arranged with 0.004-0.005 in. clearance, to allow atmospheric pressure to prevail above the diaphragm under normal conditions. The shape of the accelerator piston cam on the throttle shaft may be varied to give any degree of enrichment demanded. The economizer cam, likewise, may be given any contour to bring the economizer in or out of action at required points.

A by-pass has been provided between a point midway of the economizer bearing to a point midway of the throttle bore above the throttle, to overcome any bubbling in the fuel passageway. Since the economizer extends through the casting and the clearance is subjected to atmospheric pressure, slight amounts of air may be drawn into the passageway and cause erratic action. Through the use of the by-pass, the high manifold depression serves to draw up any air that leaks through the economizer clearance into the manifold, instead of permitting such "bubbles" to pass downward through the nozzle.

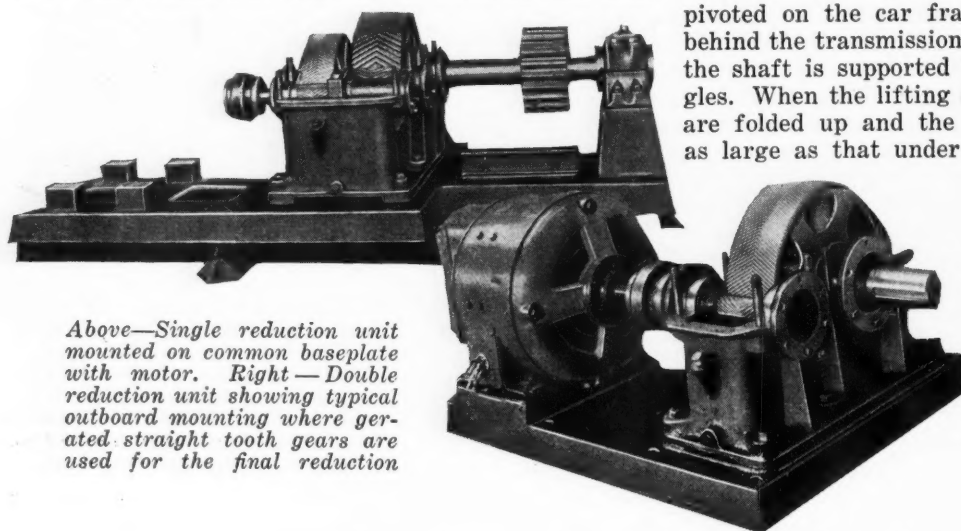
At low idling speeds the manifold vacuum is sufficiently high to draw up a small amount of liquid fuel through the economizer clearance, thus providing a richer mixture for idling.

Repeated laboratory tests have shown that delivery of fuel is practically instantaneous, even when there is no fuel in the line. Because of the venturi nozzle delivery, when a rich mixture is supplied when the engine is choked in starting, it is thoroughly atomized and the engine fires immediately.

# NEW DEVELOPMENTS—Automotive

## Speed Reducer Line

THE Farrel-Birmingham Co., Inc., Buffalo, N. Y., has recently announced a complete line of speed reducers which have Sykes continuous tooth herringbone gears and anti-friction bearings. Roller bearings are employed which have both journal and thrust capacity so that pinion and gear shafts have no end float



*Above—Single reduction unit mounted on common baseplate with motor. Right—Double reduction unit showing typical outboard mounting where geared straight tooth gears are used for the final reduction*

and are protected from injury through connected mechanism.

The mechanical efficiency of the new line is said to be 99 per cent for single reductions and 98½ per cent for double reductions. The use of roller bearings has made possible lubrication of all gears and bearings with the same oil, which is supplied through splash and flood automatic systems.

The roller bearings used in various units are interchangeable so that gears, likewise, have been made interchangeable, permitting them to be produced in larger quantities and lowering their initial cost.

Single reduction units range in ratios from 2 to 10 to 1 and in power from 3 to 300 hp. Double reduction units provide reductions from 10 to 60 to 1 with capacities from 5 to 200 hp. Other special types are available to meet almost any reduction needs and of capacities up to 5000 hp.

## Walker Parking Mechanism

BROOKS WALKER, Piedmont, Cal., has designed a device for quickly parking an automobile in restricted spaces without much effort on the part of the operator. Mr. Walker has applied the device to a Cadillac car and has been demonstrating it in Detroit recently. The mechanism and its operation will be readily understood from the accompanying illustrations.

When it is desired to park the car along the curb between two others that are not much further apart than its own length, it is driven into position with the inside front wheel close up to the curb and directly behind the forward one of the two cars already parked. The rear part of the car is then raised, by engine

power, by means of a hydraulic jack provided with caster wheels, and as soon as the wheels are off the ground, the rear end of the car is moved sideways on the casters under engine power, until the inside wheel is close to the curb. The car can be left standing on the caster wheels while parked, except in cases where the pavement is quite soft, when the caster wheels are likely to sink in.

The caster wheels are mounted on shafts which are pivoted on the car frame at points a short distance behind the transmission. Directly in front of the caster the shaft is supported in a bearing on a pair of toggles. When the lifting device is not in use the toggles are folded up and the clearance below the casters is as large as that under the rear axle center. When it

is desired to jack up the rear of the car the toggle levers are straightened out by means of an hydraulic cylinder, into which oil can be pumped by means of a pump operated from the engine and which in the case of the Cadillac demonstrating car occupies the position of the original tire pump. The hydraulic plunger operates one of the pairs of toggles directly, but the other pair of toggles

operates in unison with the former, as the upper toggle levers are both rigidly connected to a cross shaft on the frame.

As the toggle mechanism raises the frame, the axle with its wheels ordinarily would not follow the upward motion of the frame, because the weight is removed from the springs, therefore, a hook is provided which catches under the axle when the toggle approaches the straight position, so that the springs are not fully relieved. The pump is controlled by means of an extra control lever which has a compound motion, in planes at right angles to each other. Moving the lever in one plane engages the pump with the engine, while motion of the lever in the other plane determines the direction in which oil moves the hydraulic plunger.

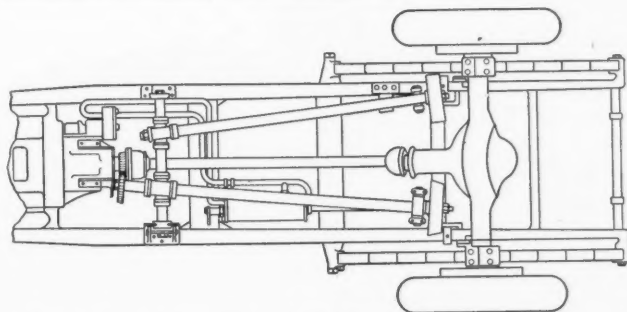
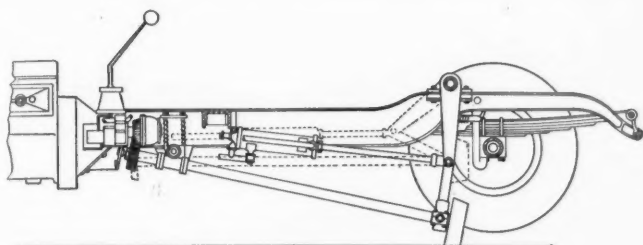
It will be noticed that the caster shaft on the right



*Photo taken from underneath demonstrating car, showing casters in the lowered position*



# Parts, Accessories and Production Tools

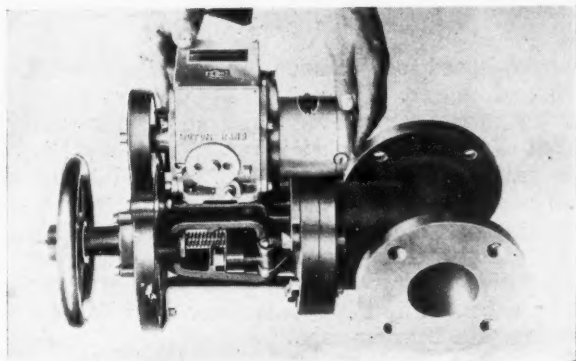


General arrangement of Walker parking mechanism

of the car, which alone is a driving shaft, is closer to the central axis, so that when the car is raised the right hand caster will carry most of the weight and therefore have a good deal of traction. The weight on this caster will be further added to if the road is crowned. The right hand caster shaft carries a gear at its forward end which constantly meshes with a pinion secured to the flange of the forward universal of the propeller shaft. The rear part of the car having been raised off the ground, the gearshift lever is set in the low forward position and the clutch is let in, whereupon the rear part of the car will be swung toward the curb. By putting the shift lever in reverse, the rear part of the car can be moved away from the curb. While the rear part of the car is thus being swung around, the rear wheels will be slowly revolving, and the sideward motion therefore can be checked by means of the car brake.

## Valve Operating Unit

A NEW motor-driven valve operating unit has just been announced by the Cutler-Hammer Mfg. Co., Milwaukee, Wis., which makes possible automatic operation of all valves up to 6 in. The new unit is small

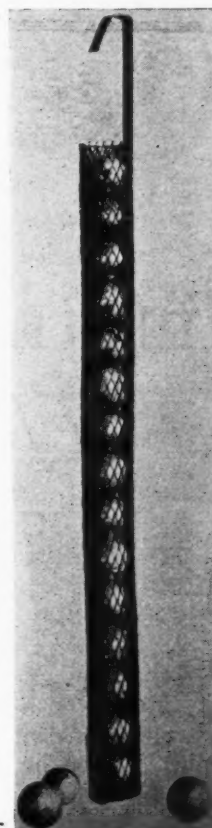


Cutler-Hammer motor-driven valve operating unit

but has a rating of 15 lb.-ft. and can be operated automatically by float switches, temperature controlling devices, pressure regulators and similar agencies, or by conveniently located push buttons.

## New Type Anode

A NEW type of anode for users of Udylyte Process in cadmium plating has been developed by the Udylyte Process Co. of Detroit. These anodes are made in the shape of a sphere and are used in a wire cylinder container which has a hook for suspension in the solution. The anode balls are dropped in from the top as the old ones are used up. As the balls corrode and grow smaller they work toward the bottom of the container, leaving room at the top for the new balls of metal. The containers are made in lengths from 18 to 36 in. The manufacturer claims that this new anode gives uniformity of deposit, the anode surface being kept constant. The anode balls, made of high purity metal, are 2 in. in diameter, weighing approximately 1 1/4 lb. each.



## Lycoming Redesigns T Series

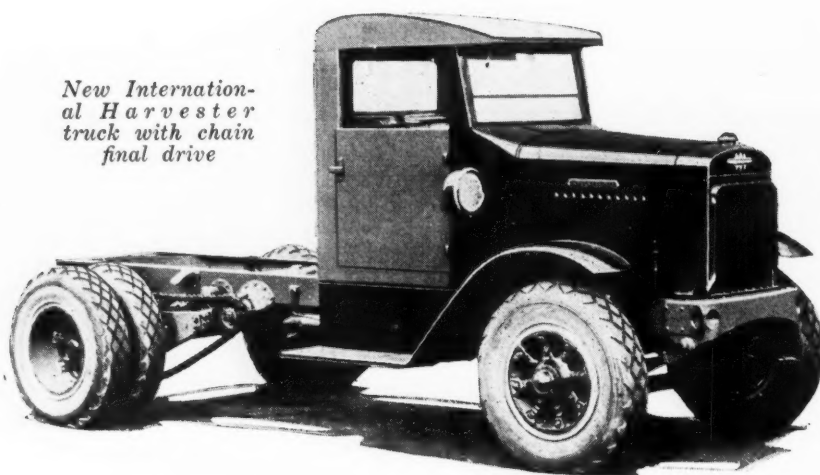
USE of a counter-balanced crankshaft is one of the outstanding features of the new T series Lycoming engine. This series, which is rated at 10 per cent greater horsepower than the former series, is comprised of six-cylinder models TF, 3 3/8 by 5 in., and TS, 3 7/8 by 5 in., both for truck and bus work.

The method of counter-balancing used by Lycoming is unique in that all the counter weights are forged integral with the crankshaft except one, which is securely fastened to a large flange with four nickel steel screws, welded to prevent any possibility of working loose.

The method of retaining the piston pin in the piston has been changed from a lock screw to a floating type construction, the piston pin being retained by use of snap rings in grooves in the piston.

The side walls of the crankcase have been increased, heavier ribs have been added from the main bearings to the bottom flange, and the width and thickness of the oil pan flange have been increased. The cylinder studs have been increased in size from 1/2 to 9/16 in. and the water passages in the cylinder block, particularly around the valves, have been enlarged. This change lowers the working temperature of the valve head and eliminates any tendency of the seat to warp, as well as improving the volumetric efficiency of the engine.

*New International  
Harvester  
truck with chain  
final drive*



*Vibration damper which is rivet-  
ed to clutch disk*

## International Harvester *Announces* *Three* New Truck Models

Capacities range from 2½ to 5 tons. Features include five-speed transmissions, mechanically-operated four-wheel brakes and vibration damper as part of clutch.

**T**HREE new truck models, having capacities of 2½, 3½ and 5 tons respectively and furnished with either a double-reduction or a chain final drive in the cases of the two lighter models, have been added to the productions of the International Harvester Company. The 5-ton model is furnished with chain drive only.

This new line of trucks is equipped with four-cylinder overhead camshaft engines, five-speed transmissions and mechanically-operated four-wheel brakes. With the exception of the engines, all of the major chassis units are identical as regards their general design and the materials used in them, and they differ only in size. The 2½-ton model is known as HS-54; the 3½-ton, as HS-74 and the 5-ton model, as HS-104, while the addition of the letter C to the chassis designation indicates that the truck is chain-driven.

The engines are Hall-Scott models 151 and 152. Model 151, which is used on the 2½-ton truck, has a bore of 4¼ and a stroke of 5½ in., which dimensions give it a piston displacement of 312 cu. in. It develops its maximum horsepower (53.5) at 1800 r.p.m., and its maximum torque of 195 lb.-ft. at 1000 r.p.m. Its compression ratio is 4.03 to 1. Model 152, which is used in the 3½ and 5-ton trucks, has a bore of 4¾ in. and a stroke of 5½ in., which makes its displacement 390 cu. in. Its compression ratio is 3.86 to 1. This engine develops its maximum horse power of 60 at 1800 r.p.m. and its maximum torque of 224 lb.-ft. at 1000 r.p.m.

The camshafts, rocker levers and valves are carried on removable cylinder heads. Each cam on the overhead camshaft actuates two rocker arms, and these in turn actuate the valves. The timing and accessory drive is by silent chain which runs over four sprockets. The chain is adjusted by rotating an eccentrically-mounted water pump and brackets. Aluminum alloy

pistons of a patented type are used. They are fitted with six rings, five of which are above the piston pins. Three of these uppers are ⅛-in. compression rings, while the other two are oil wipers. The lower ring is also a wiper but of 3/16 in. width.

Lubrication is by force-feed, the gear-type pump being built into the front of the lower crankcase and driven direct through a helical gear on the crankshaft. Felt disk, cartridge-type oil filters are standard equipment.

The cooling system includes a cast-shell, tubular-type radiator and centrifugal water pump, thermostatic control being used.

A vibration damper is a feature of the clutch, which is of the single-dry-plate type. This damper consists of a cage riveted to the driven disk, with six-cylindrical rubber cushions and a three-legged spider floated inside. Ventilating openings in the six sectors of the driven disk control expansion. A 12-in. clutch is used in the 2½-ton truck while 14-in. sizes are used in the heavier models.

### Five-Speed Transmission

The five-speed transmission is built together with the clutch and engine. It is controlled by two levers, the auxiliary or two-range lever being mounted immediately in front of the regular shift lever. The low range comprises ratios of 8.83 to 1 and 5.13 to 1, while the high range comprises ratios of 3.19 to 1 and 1.86 to 1. The fifth speed is the direct drive. Ball bearings and chrome-nickel steel are used throughout. Power take-off apertures are provided on both sides of the transmission cases, while the speedometer drive is built into the rear main bearing cage.

Propeller shafts are of heat treated seamless steel tubing equipped with universals of the two-yoke, four-



trunnioned spider type. The spider bodies form lubricant reservoirs for centrifugal lubrication of the trunnions. Steering is by the patented International steering gear with safety type drag link. This gear is of the worm and wheel, semi-reversible type.

First reduction in the double reduction rear axles is through a spiral bevel gear and the second is through herringbone gears. Heavy-duty, double row ball bearings are used throughout, with opposed tapered roller bearings at the wheels. The differential is removable as a unit from the front of the housing, which has a large inspection opening at the rear. No radius rods are used. The rear axle ratios for the 2½ and 3½-ton trucks are 6.85 to 1 and 7.85 to 1 respectively.

Various combinations of driving and driven sprockets are available for the chain-driven trucks. Standard ratios for 2½, 3½ and 5-ton trucks are: 7.22 to 1; 8.81 to 1 and 10.08 to 1. The live axle assembly is carried in the frame by a cast steel housing with a large inspection cover at the rear. Heavy-duty tapered roller bearings and chrome-nickel steel shafts are used. The driven sprockets are independent of brake drums. Drop-forged radius rods with sliding-wedge length adjustment are used.

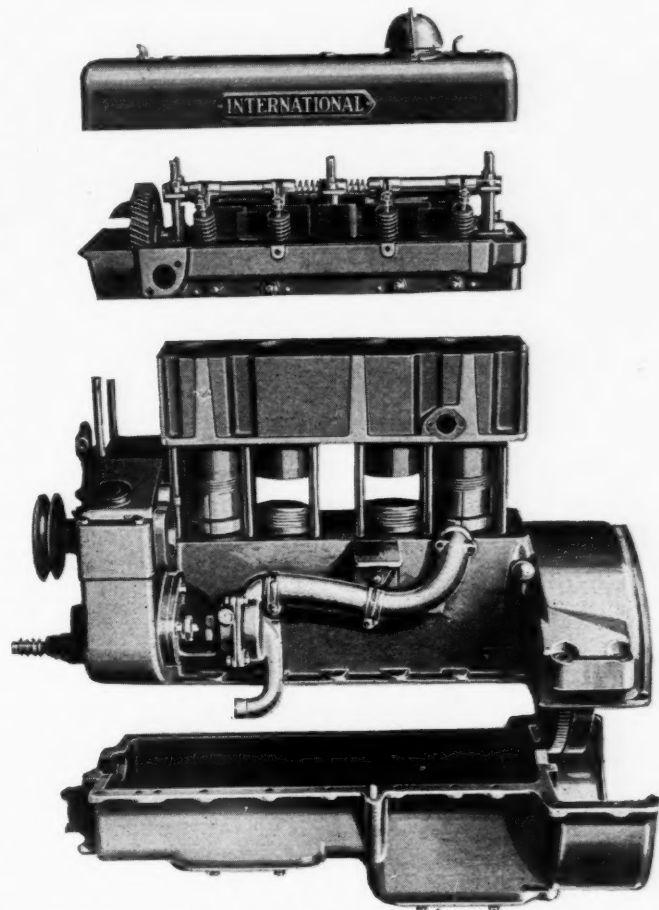
The frames are pressed steel, of 7 and 8 in. section for the 2½-ton and heavier models respectively. Both channel and tubular cross-members are used. To provide an extra margin of safety for the chain-driven models, inserted channel reinforcements extend from the front-spring rear hanger to the rear end. Towing eyes on both sides at the front, and in the center of the rear cross-member are standard equipment.

#### Semi-Elliptic Springs

All springs are semi-elliptic fitted with bronze bushings in the eyes and with rebound clips. Auxiliary springs on the double reduction models are of the inverted quarter elliptic type, while those on the chain driven models are of semi-elliptic form and are mounted above and parallel to the main springs, both of their ends being free.

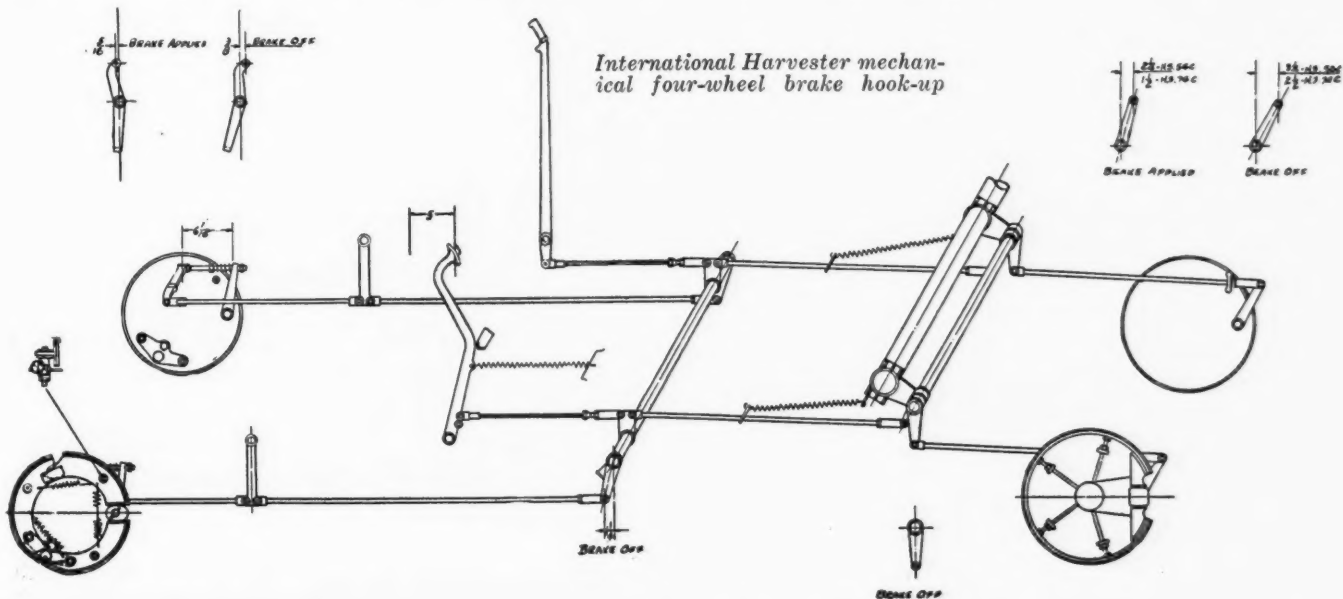
The control linkage of the four-wheel brake system is such that in the event of any rod or connection coming loose, it affects the braking action of one wheel only, no equalizers being used. The front wheel brakes on all models are of the three-shoe self-energizing type, and are inter-connected with the rear wheel brakes.

The internal rear wheel brakes vary with the type of drive. On the double-reduction models the rear wheel brakes are of the semi-floating type and are actuated by



Hall-Scott four-cylinder as used on new International Harvester trucks

cams of square section. The rear brakes on the chain-driven models are of the full-floating band type, servo-energized and self-locating in the drums. Total brake surface areas for the various models are HS-54, 726 sq. in.; HS-54-C, 732 sq. in.; HS-74, 850 sq. in.; HS-74-C and HS-104-C, 736 sq. in.



# News of the Industry

PAGE 676

VOLUME 59

Philadelphia, Saturday, November 10, 1928

NUMBER 18

## High Production Levels Continue in Many Plants

PHILADELPHIA, Nov. 10—With production of cars and trucks in the first 10 months of 1928 exceeding production in the same period of 1926 by approximately 6500, the indications are that the closing months this year will bring the excess to well above the 4,503,877 record total established in 1926.

Operations in many of the leading producing plants are at a considerably higher rate than in the closing months of 1926. Totals in November and December that year were 266,128 and 175,674 respectively. As against this, market conditions indicate that factory operations averaging 300,000 in each of the closing months this year will be warranted.

The continuation of a high production rate is resulting to a large extent from the increasing operations of Ford Motor Co. whose backlog of orders in the domestic market continues several months ahead of production.

Some little stagnation has developed in the retail field in several sections but at least part of this is expected to be dissipated with the conclusion of the national elections.

## October Rim Output 50% Ahead of 1927

CLEVELAND, Nov. 8—Automotive production continues at a record gait for the final quarter of the year, as indicated by the report for October by the Tire & Rim Association of America, Inc. Approved rim production for the month was more than 50 per cent greater than in October, 1927, the total being 2,114,611 against 1,384,924.

Production for the month was:

	1928	1927
Truck .....	358,959	173,963
Motorcycle .....	8,207	15,065
Airplane .....	1,106	....
Passenger .....	1,746,349	1,196,896
Total .....	2,114,611	1,384,924

Total by classes for 10 months:

Truck .....	2,692,672	1,761,333
Motorcycle .....	89,500	83,058
Airplane .....	15,941	....
Passenger .....	19,144,731	17,185,654
Total .....	21,932,844	18,030,045

## Cash Extra of \$2.50 is Declared by G.M.

NEW YORK, Nov. 8—Directors of General Motors Corp. today declared an extra cash dividend of \$2.50 on common stock payable Jan. 4 to stock of record Nov. 17. Regular dividends on common and preferred were also declared, payable Dec. 12.

A proposition will be submitted at a stockholder meeting Dec. 10 to issue two and one-half shares of newly created stock in exchange for each share of present common. The proposed new stock would in no way alter the outstanding capitalization and surplus.

It is expected the rate on the new stock would be based on regular dividends of \$3 a share a year, equivalent to \$7.50 a share on present stock as compared with the current dividend rate of \$5.

## Oakland Output 17,232

PONTIAC, Nov. 7—Oakland Motor Car Co. reports sales for October of 17,232, comparing with 15,618 in October last year. Sales for the first 10 months this year totaled 243,111 against 176,172 in the same period last year.

## Durant Sets October Record

NEW YORK, Nov. 7—Durant Motors reports that October production was 42 per cent higher than any October in the history of the company, the highest preceding October being in 1925.

## Postal Receipts Gain

WASHINGTON, Nov. 8—October postal receipts in 50 selected cities amounted to \$34,196,000 as compared with \$32,449,638 during 1927, representing an increase of 5.38 per cent, and indicative of brisk business conditions in the country.

## British Producers to Support Dealers

LONDON, Nov. 3—At the recent annual gatherings of various British makers and their distributors and dealers there has been evident a desire on both sides for closer cooperation. Thus, the managing director of Singer & Co. announced that monthly meetings would in future be held at which the chief distributors and the company's sales organization would be represented, enabling the former to put forward suggestions, individually or collectively, for consideration and discussion.

At the Austin meeting, Sir Herbert said that his company had prepared a course of salesmanship, open to members of the sales staffs of all distributors and dealers.

## Paris Salon Attracts Attendance of 677,931

WASHINGTON, Nov. 8—Twenty-five per cent of the automobiles displayed at the International Automobile Salon of Paris were of American make, according to the Department of Commerce.

A total attendance of 677,931 persons was one of the features of the salon at the Grand Palais, where 1200 exhibits of passenger cars, bodies, parts, accessories, tires, oils and allied products valued at \$4,000,000 were shown.

One hundred and twenty-two makes of automobiles were on display of which 71 were French made.

## Sales Rise 6840 in October

DETROIT, Nov. 8—Dodge Bros. Corp. set a new all-time record for October, shipping 6840 more cars and trucks from the United States and Canadian plants than in October last year. For the five weeks' period ended Oct. 27 dealers report sale of 21,396 cars, a new all-time record when compared with any previous corresponding period. Marked improvement in used car market was noted in southern cities.



## Chrysler Organizes Export Corporation

Names E. C. Morse President  
of Subsidiary to Direct  
All Overseas Sales

NEW YORK, Nov. 7—Chrysler Export Corp. has been organized in Detroit to handle the overseas business of all Chrysler and Dodge Brothers lines. The new company will have charge of the overseas distribution of Chrysler sixes, Dodge Brothers cars, Graham Brothers trucks, Plymouth and De Soto cars and Fargo trucks.

E. C. Morse, for four years director of export sales of the Chrysler Sales Corp., is president and general manager of the new corporation. Prior to his association with Chrysler he was for many years sales manager of the Hudson Motor Car Co. and previously director of export for the National Cash Register Co.

Mr. Morse is planning to surround himself with efficient and experienced men who heretofore have been assisting in the development of the overseas organizations of Chrysler and Dodge Brothers. The separate identities of the two lines will be maintained under this new organization.

No change is contemplated in methods and policies which have been successful in overseas distribution of the Chrysler and Dodge lines and it is planned to increase economy and efficiency by this move. The cooperation of all parties, according to Mr. Chrysler, will permit closer and more specialized attention to the needs and requirements of the overseas market.

### Sim Promoted by Dodge

DETROIT, Nov. 8—Frank N. Sim has been appointed advertising manager for the Dodge Brothers division of the Chrysler Corp. Mr. Sim's first connection with the industry was in 1913 as assistant advertising manager of Timken Detroit Axle Co. He became identified with Dodge Bros. as a field representative in 1924 and recently has been Detroit district representative.

### Mack Truck Net \$1,622,391

NEW YORK, Nov. 7—Mack Trucks, Inc., for the quarter ended Sept. 30 reports net profit of \$1,622,391 after all charges, equivalent to \$2.20 a share on the 735,678 shares of no-par common stock. This compares with \$2,084,383 or \$2.83 a share in the preceding quarter and with \$1,425,853 or \$1.60 a share, on 713,434 common shares in the third quarter last year. Net profit for the first nine months of the year totaled \$4,452,446, equal to \$6.05 a share on common.

### Reo Names Division Heads

LANSING, Nov. 6—Three important appointments are announced by C. E. Eldridge, general sales manager of Reo

Motor Car Co. J. H. Lemons, manager of the company's branch at Houston, has been appointed sales manager for the Western division. E. G. Poxson, assistant sales manager, has been made sales manager of the Eastern division, and L. C. Moore, heretofore sales correspondent, has been advanced to the position of sales manager of the New England division. The three positions are newly created.

## Dodge Bros. Prices Reduced \$150-\$250

DETROIT, Nov. 8—Price reductions ranging from \$150 to \$250 have been made effective by Dodge Bros. Corp. on its Standard and Victory lines, the purpose of the reduction being to promote volume production and sales, according to the factory announcement. The new and old prices follow:

Standard Six		
	New	Old
2-pass. coupe .....	\$725	\$875
2-door sedan .....	735	895
4-door sedan .....	765	930
Cabriolet .....	775	945
De luxe sedan .....	795	970
Sport cabriolet .....	795	970
Victory Six		
	New	Old
Touring .....	\$795	\$995
Roadster .....	795	995
Coupe .....	845	1,045
Sedan .....	895	1,095
4-pass. coupe .....	945	1,095
De luxe sedan .....	945	1,170
Brougham .....	945	1,170
Sport touring .....	995	1,245
Sport roadster .....	995	1,245
Sport sedan de luxe .....	1,045	1,295

### Packard to Hold Output Near Present High Level

DETROIT, Nov. 6—All records for the shipment of cars since the first Packard car was completed Nov. 6, 1899, were broken by the Packard Motor Car Co. in October with the 5800 total. "Even with this record-breaking production," said H. W. Peters, vice-president in charge of distribution, "we have not been able to catch up with demand. Distributors in all parts of the world are clamoring for cars and we have been forced to increase production beyond original plans. We will have to carry this high rate along through the rest of the winter and even then sales will exceed actual supply of cars."

"It is a noteworthy fact that our shipments abroad during October represented a big increase over anything we had ever before done in the foreign field."

### Hudson Promotes Barrett

DETROIT, Nov. 7—Promotion of F. L. Barrett to be manager of districts for the Hudson Motor Car Co. was announced by Courtney Johnson, general sales manager. Mr. Barrett has been retail sales manager, wholesale representative, distributor and manager of branches for several leading automobile companies.

## Business in Brief

Written by the Guaranty Trust  
Co., New York, exclusively for  
AUTOMOTIVE INDUSTRIES.

NEW YORK, Nov. 8—Jobbing and retail trade have been stimulated by the seasonable weather, and in the past week fall goods have sold more readily. In some sections of the country holiday buying has already started.

### MAIL ORDER SALES

Aggregate sales of two large mail order houses for October totaled \$63,587,000, as compared with 50,814,281 for September and \$50,869,000 for October, 1927.

### PETROLEUM OUTPUT

The average daily crude oil production for the week ended Oct. 27 amounted to 2,523,700 bbl., which compares with 2,504,400 bbl. for the preceding week and 2,466,550 bbl. for the corresponding week last year.

### FREIGHT CAR LOADINGS

Car loadings for the week ended Oct. 20 totaled 1,162,095 cars, which shows a decrease of 28,032 cars below the total for the previous week and an increase of 33,040 cars above the total for the corresponding week last year.

### FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Nov. 3 was 97.9 which compares with 98.4 the week before and 98.9 two weeks before.

### BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended Oct. 31 were 8 per cent above those for the corresponding week last year.

### STOCK MARKET

The stock market during the past week was marked with a high degree of irregularity, although the general tone was strong with an upward trend. The copper group displayed great strength and was well maintained even at those times when the general tone was reactionary.

### MONEY MARKET

The most notable feature of the money market for the week ended Oct. 31 was an increase of \$134,871,000 in brokers' loans in New York City, which brought the total up to \$4,907,164,000. This marks the fifth successive week in which a new high for all time was reached.

### FEDERAL RESERVE REPORT

The combined statement of the Federal Reserve banks for the week ended Oct. 31 showed increases of \$20,300,000 in holdings of discounted bills, of \$38,900,000 in bills bought in the open market and of \$49,200,000 in member bank reserve deposits. In the New York district alone there was an increase of \$24,500,000 in holdings of discount bills.

# OCTOBER TOTALS EXCEED 1927 LEVELS

**Operations Throughout Industry Generally Show Gains—  
Five Companies Exceed September—November Sched-  
ules Show Continued High Seasonal Level**

PHILADELPHIA, Nov. 8—Reports on production by leading companies in October show a rate of operations close to the September rate, some companies showing minor gains over their September outputs. In practically all cases the rate of operations in October last year was far exceeded. Companies which reported gains over September totals were Ford, Buick, Packard, Cadillac and Chrysler.

Ford Motor Co. output in October was 106,204 cars and trucks bringing the total output in the United States on the new car to 568,130 and Ford world output to more than 615,000. Current daily output is now close to 6000 cars and trucks daily in all plants throughout the world.

Cadillac Motor Car Co. reported output in October of 5022, following outputs in the two previous months of more than 5000 each.

Hupp Motor Car Corp. shipments in October totaled 4129, comparing with 2416 in October last year and with 6536 in September. Shipments for the first 10 months totaled 61,121 against 32,322 in the corresponding period last year. The company carried over in November unfilled orders for 1367 cars.

Olds Motor Works shipments in October totaled about 7000 cars as against 9301 in September. Shipments in the first 10 months totaled about 83,000.

Reo Motor Car Co. shipments in October totaled 2800 cars and trucks against 3711 in September and against 4604 in October, last year. Shipments were lower in October owing to manufacturing changes in one of its lines. November schedule is for 4000 cars and trucks. Shipments in the first 10 months totaled 41,691 units, against 42,305 in the 1927 period.

Packard Motor Car Co. established a new monthly shipping record in October, shipping 5802 cars, compared with 4354 a year ago and September shipments of 4800. The previous record month was August this year, with 5001 shipments. Ten months' shipments this year totaled 40,835 compared with 28,678 in corresponding period last year. The November schedule is for 5500 cars.

Retail sales of Gardner cars for the month of October showed an increase of 176 per cent over the same month last year, according to Russell E. Gardner, Jr., president of the Gardner Motor Co., Inc. Gardner production in October showed an increase of 97 per cent.

With shipments in October the greatest in its history for that month, Marmon Motor Car Co. for the first 10 months of the year announces a 55 per cent increase in production over the same period last year. October busi-

## PRODUCTION

	Oct.	Sept.
Ford .....	106,204	100,000
Buick .....	28,614	26,742
Nash .....	17,200	20,606
Graham-Paige ..	4,921	6,700
Packard .....	5,802	4,800
Auburn .....	1,306	.....
Reo .....	2,800	3,711
Hupp .....	4,129	6,536
Olds .....	7,000	9,301
Cadillac .....	5,022	5,000

ness showed substantial gain over September, G. M. Williams, president, reports.

Graham-Paige Motors Corp. manufactured 4821 cars in October, a new high record for the month. This compares with 3263 in October, 1926, previous high month. Production for the first 10 months totaled 70,406 compared with 18,800 last year.

A new October record was established by Buick Motor Co. which shipped 28,614 cars compared with 26,800 cars in September of this year and 23,000 cars in October last year. Since introduction of the new models Buick has shipped 100,680 cars.

Nash Motors Co. production for October exceeded 17,200 cars, an increase of 10,000 over October, 1927. For the 11 months ended Oct. 31, production was about 129,000 units.

Auburn Automobile Co. reports the largest October business in its history with shipments totaling 1306 cars.

## Continental to Continue High Production Schedule

DETROIT, Nov. 5—Continental Motors Corp. production schedules for November and December indicate continuance of heavy operations, according to T. M. Simpson, secretary. The company is getting larger orders for engines from industrial and automotive customers, he said, and it has a standing order for 1000 crankshafts daily from Motor Motor Co. Prospects for for next year indicate increases over the present year's business.

## Stearns-Knight "80" Reduced

CLEVELAND, Nov. 3—Prices on all Series 80 models of the Willys-Knight line have been reduced \$300, effective Nov. 1, according to announcement by Stearns-Knight Sales Corp.

## Peerless Signs Dealers

CLEVELAND, Nov. 3—Several important European and South American dealers have signed contracts to handle Peerless automobiles, according to word

received at the factory in Cleveland from R. M. Calfee, chairman of the Peerless board of directors, and Walter Zimmerman, Peerless export manager, both of whom are overseas.

O. Y. Laatuva has taken on the Peerless line for Helsingfors, Finland; Gaspar Auguistapace, at Buenos Aires, and J. Kosticka, Prague, Czechoslovakia; Frank L. Getman, Havana, Cuba; Max Hofman, Vienna, Austria.

## New Chrysler Evansville Units to Cost \$500,000

EVANSVILLE, IND., Nov. 5—The expansion program here of the Chrysler Corp., which according to recent announcement will double the production capacity of the Graham Brothers motor truck division plant, will be under way Jan. 1, and will cost \$500,000.

The new building units of varying dimensions will extend along the Maxwell avenue side of the industry for a distance of 600 ft. and will provide an addition of 130,000 sq. ft. of operating area.

## Chicago Shows Increases in Car Sales and Stocks

CHICAGO, Nov. 5—New car sales in the Chicago Federal Reserve District in September decreased 15.5 per cent from August but were 78.5 per cent higher than in September last year. New car stocks increased 28.6 over August and 5.6 over September last year. Used car sales were 13.1 under August but 24.5 higher than in September last year. Used car stocks increased 8.4 over August and 9.9 over September last year.

## Post Heads B. & S. Board

HARTFORD, CONN., Nov. 5—David J. Post has been elected chairman of the board, and A. H. Deute, vice-president and general manager of Billings & Spencer Co., following the adoption of a plan of reorganization on which stockholders will vote Nov. 19. F. C. Billings remains president and treasurer. The new board of directors includes the above officers and R. J. Goodman, Edward Milligan, L. F. Robinson, Nelson Smith and L. E. Zacher.

## Italy Exports 16,661 Cars

WASHINGTON, Nov. 8—Exports of motor cars from Italy for the first seven months of this year totaled 16,661, worth a total of 230,042,279 lire. The number of cars sold thus far in 1928 represents a decrease of 25.6 per cent from the corresponding period of 1927 when 22,309 cars were sold.

## Foote-Gear Buys Plant

CHICAGO, Nov. 5 — Foote-Gear Works, Inc., has purchased additional property which will more than double the capacity of the present plant.



## G.M. Assets Show \$139,375,753 Rise

Total Passes Billion and a Quarter—Reserves Show Increase of \$27,000,000

NEW YORK, Nov. 5—General Motors Corp. condensed consolidated balance sheet as of Sept. 30, 1928, shows total assets of \$1,237,853,329, out of which \$507,450,707 are listed as current and working assets. This compares with total assets as of Dec. 31, 1927, of \$1,098,477,576, of which current and working assets constitute \$442,280,123.

Current liabilities at the end of September this year were \$144,705,288 as compared with \$159,356,147 at the end of 1927. Reserves amounted to \$205,696,529 as compared with \$178,782,370 at the end of last year. Capital stock amounts to \$569,916,000, the same as at the close of 1927. Surplus is \$314,133,275 as compared with \$187,819,083 at the end of last year.

### Yellow Truck Loss \$700,253

DETROIT, Nov. 5—Net sales of Yellow Truck & Coach Mfg. Co. for the nine months ended Sept. 30 were \$36,173,571 with net profit before provision for depreciation, \$105,760. After provision for depreciation, operations showed a net loss of \$700,253. A larger net loss of \$1,059,988 was offset by profit of \$359,735 by Yellow Mfg. Acceptance Corp., a subsidiary.

### Yellow Buys 300 G.M. Taxis

NEW YORK, Nov. 5—Yellow Taxi Corp., New York, has just ordered 300 new model Yellow Cabs for immediate delivery from General Motors Truck Co. This raises the total number purchased from General Motors this year by the taxi company to 900. With the delivery of this equipment, all taxis owned by this corporation will be of the driver enclosed type.

### Expands Oshawa Plant

DETROIT, Nov. 5—To cope with increased business, the stamping plant of General Motors of Canada, Ltd., at Oshawa, Ont., will be doubled in capacity, and an additional 300 men will be employed. The basement under the present stamping plant is being made ready for occupancy at a cost of about \$40,000, and an additional \$40,000 is being spent for new machinery. The new section of the plant will be in operation about March 1. A new brake testing division also will be installed.

The stamping plant is used chiefly for the manufacture of fenders, hoods, radiator shells, and other sheet metal products used in making automobile bodies. The opening of a new plant at Regina and the reopening of the Walkerville plant, both of which will assemble parts made in Oshawa and other eastern centers, will, it is expected, increase the volume of work for the local plant.



Man of Parts

N. H. Boynton, director of sales promotion of National Lamp Works, who is first M. & E. A. president

## Wiman Deere President, Butterworth Heads Board

MOLINE, Nov. 5—William T. Butterworth, president of Deere & Co. since 1907, and also president of the U. S. Chamber of Commerce, has been made chairman of the board of directors, an office recently created. Charles Deere Wiman, for the last four years vice-president of the company, was made president and will continue to have charge of factory operations in addition to his duties as president.

## Seiberling Tire to Build \$3,000,000 Plant on Coast

OAKLAND, CAL., Nov. 5—Seiberling Tire & Rubber Co. has announced plans for a \$3,000,000 plant in this city near the site of the proposed \$7,000,000 Chrysler factory here, recently announced. The initial output, it is stated, will be 2500 tires a day to be increased later to 5000 tires daily.

F. A. Seiberling, president of the company, and Karl Kilbourn, chief engineer, are expected here within the next few weeks to arrange for the beginning of construction work.

## Moore Forging Adds Unit

SPRINGFIELD, MASS., Nov. 3—Moore Drop Forging Co., manufacturer of forgings for automobile parts, is erecting a new brick and steel one-story addition of flatiron shape, covering 6500 sq. ft., to house the inspection department of the Chicopee plant. The plant is being improved by the addition of new hammers, transformers and other equipment. A contract for various Ford parts has been an important item in stimulating production by this concern.

## Too Much Sameness in Ads, Says Jordan

Tells N.A.C.C. Group Individuality is Lacking—Overseas Advertising Studied

NEW YORK, Nov. 5—Present-day advertising lacks personality and individuality, Edward S. Jordan told the meeting of the advertising group of the National Automobile Chamber of Commerce meeting in Cleveland last week. Mr. Jordan's topic was "What Is Wrong With Automobile Advertising?" and he indicated that individual manufacturers should pick out dominant and distinctive characteristics of their own product and advertise these as something which cannot be obtained in other cars, thus getting away from the sameness which is today evident in all automobile advertising.

L. H. D. Weld, manager of the foreign department of H. K. McCann Co., spoke on "How to Buy Overseas Advertising in Europe." He indicated that there are three methods available, first, to use a foreign agency; second, to use an American agency with overseas branches, and third, to use an American agency supervising foreign agencies abroad. He believes that the last method is preferable in that foreign agencies are closer to their local markets but that they need supervision by American agencies.

John V. Lawrence of the foreign trade department of the N.A.C.C., spoke on "Advertising for the Central-American Field." This field, he indicated, needs specially written advertising inasmuch as the appeals which sell cars to the American public are meaningless to the Central-American car buyer. Speed advertising is useless as the roads are in such condition that speed is impossible. Road clearance is an important feature to advertise in selling cars in this market, Mr. Lawrence continued. Words used in this advertising should generally be simple and within the experience of people you are attempting to convert into buyers.

Paul Watson, vice-president of Ruthrauff & Ryan, Inc., spoke on "How We Test Media for Pulling Power." He indicated that test cities should be chosen and campaign types tried out in these cities. In general, he advocated individual contracts with the local papers rather than paying of group rates.

## Spicer Earns \$1,245,388

DETROIT, Nov. 5—Spicer Mfg. Corp. and subsidiaries in the nine months ended Sept. 30, show profit of \$1,245,388 after depreciation, etc., but before Federal taxes, against \$1,023,198 in the 1927 period. September quarter profits were \$390,433, against \$433,687 in preceding quarter and \$390,567 in third quarter of 1927.

# Men of the Industry and What They Are Doing

## Jarrard Joins Marmon, Durant Appoints DeBow

The appointment of Jack DeBow as western district manager of Durant Motors Corp., with headquarters in Lansing, is announced by T. S. Johnston, assistant to W. C. Durant, who has been in Lansing conferring with sales officials on company policies. Mr. DeBow previous to the appointment was assistant to Thomas E. Jarrard, who has resigned as sales manager of the Durant Motor Corp. of Michigan to become sales director of the Marmon Motor Car Co. L. D. Haas has been promoted to the position of assistant to Mr. DeBow and Henry Day will continue in charge of sales for the Lansing territory.

## Wright Guest of Honor

Orville Wright has been designated as the guest of honor of the International Civil Aeronautics Conference, which will be held in Washington Dec. 12, 13, and 14. Mr. Wright is a member of the American delegation named by President Coolidge last week and the honor was conferred upon him in recognition of his pioneering work in aviation.

## Hartnett Heads Boosters

The Automotive Boosters' Club No. 10, of San Francisco, has chosen the following officers for the coming year: D. J. Hartnett, president; James Wheatley, Jr., secretary-treasurer; John F. Morse, vice-president; J. A. Devine, vice-president; Paul Gardner, Ralph Rowland and W. E. Imhoff, directors.

## Willis Heads P-A Sales

George E. Willis, managing director of the Studebaker Corp. of Australia for the last two years, has been appointed vice-president in charge of sales of the Pierce-Arrow Motor Car Co. He has been associated with the Studebaker corporation for the past 15 years.

## Grice Succeeds Warner

John Grice, formerly with the White Truck Co., has been appointed manager of the St. Louis branch for the Indiana Truck Co. He succeeds Joseph Warner, who managed the St. Louis Indiana branch for the last four years.

## Aument Joins Atlantic

C. M. Aument has resigned as experimental engineer with the International Motor Co., to become production manager of the Atlantic Aircraft Corp. at the Teterboro and Passaic plants.

## Fage Joins Graham-Paige

Graham-Paige Motors Corp. has established a district office in Philadelphia, with W. C. Fage as district man-

## Moves Up

The N.S.P.A. line moves from left to right. The new president, W. E. McIlroy, of SKF Industries, is at the left and L. T. White, retiring president, at right.



ager. Mr. Fage was formerly with Packard at New York and until recently with Chrysler as district supervisor with headquarters at Cleveland. His new territory will cover most of Pennsylvania and part of Maryland.

## James and Eldred Promoted

Hudson Motor Car Co. has promoted W. A. James to be assistant general sales manager and A. J. Eldred to be advertising manager. Both men have been with Hudson for many years and are well known in the automobile advertising world. Before the promotion, Mr. James was advertising manager and Mr. Eldred was in charge of publicity.

## Hill Back From Europe

L. Clayton Hill, assistant sales manager of the Murray Corp. of America, has returned from Europe after visiting the shows in company with other Murray executives. Charles Widman, vice-president, and Harry Shaw, chief designer, are remaining abroad to visit the Berlin show and study developments in Brussels and Vienna.

## Van Pelt Leaves Ball Crank

C. H. Van Pelt, general sales manager for the Cincinnati Ball Crank Co., has resigned. Mr. Van Pelt has been with the company 11 years as secretary and sales manager and during the last three and a half years held the title of general sales manager.

## Named Aviation Officers

P. W. Litchfield, president of the Goodyear Tire & Rubber Co. and the Goodyear Zeppelin Co., and G. H. Housh, of Fisher Body Corp., have been elected directors of the National Aviation Corp. of New York, a financing concern for aviation enterprises.

## Universal Promotes Warner

A. A. Warner, who has been associated with the Universal Products Co., of Fordson, Mich., for several years, has just been promoted to sales manager.

## G.M. Export Changes

E. K. Wild, assistant general service manager in charge of parts of General Motors Export Co., sailed Nov. 8 for Australia. Mr. Wild will visit General Motors Australia, Melbourne; General Motors New Zealand, Wellington, and General Motors Java, Batavia, before returning to America. R. A. Hooper, formerly service and parts manager of General Motors Peninsular, Madrid, has been transferred to the Honolulu branch of General Motors Export Co. in the same capacity.

## Hawxhurst Named Representative

Norma-Hoffmann Bearings Corp. has appointed Major B. Hawxhurst, well-known in automotive circles, as representative in Detroit for the sale of Norma-Hoffmann precision ball and roller bearings. Mr. Hawxhurst will have his offices in the Eaton Tower.

## Crowe Joins Herron Zimmers

O. J. Crowe, formerly of the C. R. Wilson Body Co., the American Body Co. and later the Motor Products Corp., has now become associated with the Herron-Zimmers Moulding Co., of Detroit, manufacturers of body moldings.

## Colby Aide to Anderson

Fred L. Colby, Jr., is now associated with D. R. Anderson as assistant manager of the Berryloid department of the Berry Brothers Varnish Co., Inc. Mr. Colby is the son of F. L. Colby, president of Berry Brothers.

## Heiskell Back From Abroad

A. R. Heiskell, vice-president and secretary of the Marmon Motor Car Co., has just returned from a European tour in which he visited the London and Paris shows.

## Frazier Injured in Accident

J. W. Frazier, general sales manager of the Chrysler Corp., is recovering from injuries suffered recently when his automobile figured in a collision with a truck.



## Russian Engineers Buy Equipment Here

### Machinery and Plans for \$17,500,000 Tractor Plant to be of American Origin

NEW YORK, Nov. 5—In order to prepare for the construction of a \$17,500,000 tractor plant at Dzhirzinsky, 13 Soviet engineers are in this country for the purpose of purchasing equipment and arranging for engineering operations on the construction and layout of the plant. The delegation is headed by Mr. Tsentsipper, chief engineer of the construction work. Headquarters of the delegation is at the Amtorg Trading Corp., 165 Broadway, this city.

This plant, according to Mr. Tsentsipper, will have an annual capacity of 20,000 tractors and will be the largest tractor factory in the U.S.S.R. The Putilovetz Works in Leningrad, which have been producing 1500 tractors annually, are being enlarged to an annual capacity of 5000.

The Dzhirzinsky commission will visit a number of American tractor plants and arrange with a number of firms for special training of Soviet engineers in American production methods.

### Foreign Car Registrations Increase 958,000 in Year

WASHINGTON, Nov. 8—Heavily increased consumption of rubber outside this country is predicted for 1929 by the Department of Commerce. The annual rate of rubber consumption outside the United States is about twice that in 1922 and the steady increase in foreign automobile registrations indicate to the department a comparative increase in the demand for rubber.

Foreign automobile registrations in 1928 are given at 6,425,000, which was an increase of 958,000 over 1927. Foreign rubber consumption is estimated at 215,000 long tons for 1928.

Tire exports from the United States, however, are expected to show little increase in 1929 because foreign markets will be supplied from British factories so that practically all the 1929 increased demand for tires abroad will be met, it is expected, by foreign production.

### Martin-Parry Net \$170,669

NEW YORK, Nov. 6—Martin-Parry Corp. reports for the year ended Aug. 31 loss of \$620,905 after charges and inventory adjustment. Profit on sale of investments in the Oakes Co. was \$791,574, leaving net profit for the year of \$170,669. This compares with net income of \$5,234 in the preceding year.

#### Start Chicago-Detroit Route

CHICAGO, Nov. 3—The 34th scheduled airplane line operating in and out of Chicago was started this week when a 12-passenger cabin plane of the Stout

Air Services, Inc., left the municipal airport on the first flight of a new daily passenger service to Detroit.

Planes will leave Chicago and Detroit simultaneously at 2 o'clock each afternoon, flying the 250 miles air route in 2½ hours. Each plane will be operated by a pilot, relief pilot and a flight engineer, who will act as conductor. No stops are scheduled in the route, which leads around the tip of Lake Michigan and across the State of Michigan.

## Cincinnati Studies Car Salvage Plants

CINCINNATI, Nov. 5—Discussion of the merits of the automobile salvage yard plan since the August convention in Cincinnati of the Ohio Council, National Automobile Dealers Association, has reached such a point that a committee from the Cincinnati Automobile Dealers' Association has been named to make a trip of inspection of yards in western cities. The committee, which is headed by J. W. Tarbill, will leave Nov. 6 to visit the yards in Milwaukee, Omaha, Kansas City and St. Louis, to get first-hand information regarding operation and costs.

At the time of the August convention, the junk yard plan did not appeal strongly to Cincinnati dealers, but since then successful reports from yards now in operation created some favorable opinion. This has grown to such an extent, it was decided to have the committee make the inspection trip and submit recommendations as to the advisability of establishing a cooperative salvage yard here.

#### St. Louis Junks 900 Cars

ST. LOUIS, Nov. 5—Nine hundred automobiles have been reduced to junk and spare parts in the junk yard operated by the St. Louis Automobile Dealers' Association since Sept. 1. The top price paid for "junks" is \$50, the average price being about \$15. The yard has done a brisk parts business, the best day so far bringing in receipts of \$257. The junk yard is owned by the dealers as a closed corporation and promises to be a profitable sideline.

### Mengel Earnings Gain

LOUISVILLE, KY., Nov. 3—A report by the Mengel Co., covering its activities for the first nine months of the current year, shows continued sharp increase in earnings, with a total of \$781,146.36 before deduction of Federal income tax. Profits for the third quarter, before deduction of income tax, was \$159,876. Unfilled orders as of Oct. 1 were \$1,627,000, as compared with \$1,551,000 on Oct. 1, 1927.

### Chevrolet Ohio to Build

TOLEDO, Nov. 5—General Motors Corp. is enlarging the plant here of the Chevrolet Motor Co. of Ohio, manufacturer of transmissions for Chevrolet and for Pontiac.

## Financial Notes

Commercial Investment Trust Corp. has voted an increase in cash dividend from \$3.60 to \$4 a share and the inauguration of a regular stock dividend of 4 per cent, payable 1 per cent per quarter and the offering of rights to subscribe to an aggregate of 127,429 additional shares of common stock at a price of \$95 a share, more than \$40 lower than the current market price. The privilege of purchasing additional stock at \$95 a share will be on the basis of one additional share for each four shares held of record Nov. 12.

Marlin-Rockwell Corp. reports net profit for the nine months ended Sept. 30 as \$1,404,035. This is equivalent to \$3.88 a share and compares with \$709,650, or \$2.06 a share, for the corresponding period of 1927. Earnings for the quarter ended Sept. 30 were \$438,229, or \$1.21 a share, as compared with \$84,601, or 24 cents a share, for the corresponding quarter of 1927.

Boeing Airplane & Transport Corp., recently formed by the merging of the Boeing Airplane Co., Boeing Air Transport, Inc., and Pacific Air Transport, has issued privately 90,000 shares of 6 per cent cumulative preferred stock, Series A, and 27,000 shares of common stock in units of 10 shares of preferred and three shares of common at \$590 a unit.

Kelly-Springfield Tire Co. control has passed to a new group or to the public with the expiration of rights on the new common stock Nov. 1. Subscription through the exercise of rights took all but about 24,000 of the new 700,000 shares of common offered.

U. S. Rubber Co. directors have adopted a resolution recommending the changing of the common stock from \$100 par to a no par basis. Stockholders will meet Dec. 7 to vote on the change.

Triplex Safety Glass Co. has declared a 100 per cent initial stock dividend payable Nov. 1 to holders of record Oct. 26.

#### Loening Adds 8-Passenger Plane

NEW YORK, Nov. 3—Loening Aeronautical Engineering Corp. has designed and placed on the market a new cabin passenger amphibian plane for commercial purposes capable of carrying eight persons. This plane, known as Model C-2, uses the same wings as the older models but increased cabin space is made so that six passengers can travel in the cabin and there are two seats in the pilot's cockpit. The new plane has a wing load of 11.3, a power load of 11.2 and a pay load of 1200 lb. It is powered with one Pratt & Whitney Horney or one Wright cyclone engine and has a cruising speed of 110 miles at 1700 r.p.m.

### Pease Moves Office

NEW YORK, Nov. 5—The New York sales office of the C. F. Pease Co., Chicago, has been moved to the Ashforth Building at 12 East Forty-fourth St. T. K. Murney is Eastern sales manager.

## Automotive Steels Maintain Activity

Some Mills Continue Behind on Deliveries—Higher Price Schedules Near

NEW YORK, Nov. 8—Movement of steel, especially of sheets and strip-steel, into automotive consumption continues in good volume, with some mills still considerably behind in their deliveries. Because of the tonnages involved, the requirements of the two leading manufacturers of low-priced motor cars come in for special attention, but inquiries indicate fully as keen an interest in the market on the part of manufacturers of medium and higher-priced motor cars and the parts makers who cater to this class of trade. Automotive alloy steel manufacturers consider the outlook as bright.

In some quarters it is stated that announcement of higher first-quarter 1929 sheet prices will be made within the next 10 days; others consider such a move unnecessary before the turn of the month. The new card of extras issued by hot-rolled strip steel manufacturers will bring about a marked shift in prices. Nominally these changes range from an increase of \$6 a ton to a decrease of \$15, but inasmuch as material over 12 in. wide has for a long time been sold on the basis of plate or sheet prices rather than on a strip base plus extras, the increase is merely a reclassification.

It is pointed out that the new card of extras fails to take into consideration tonnage, and that a base price applying alike to single carloads and 1000 tons, is likely to undergo considerable modification in the course of time. Ford demand for hot-rolled strip steel has been running heavy. Most consumers are covered over the current quarter, and this accounts for the fact that, while the new card of extras has gone into effect in nearly all mills, relatively little new business has been transacted under it. The market for cold-rolled strip is stronger, many producers being unwilling to book business at below 2.85 cents, Pittsburgh, which price level it is sought to establish for first quarter 1929 business. The cold-finished steel bar market seems to be definitely on a 2.20 @ 2.25 cents basis.

**Pig Iron**—Strength and considerable activity feature the pig iron market. The Michigan price is \$19. The Valley market has advanced to \$17.50 for No. 2 foundry and \$18 for malleable. Chicago quotations are \$19.50 for both malleable and foundry base grades, delivered.

**Aluminum**—Routine market conditions continue. A slight tapering off in demand from automotive consumers is expected over the remainder of the year, but so far it has not made itself very much felt. Prices for virgin and remelted metal are well maintained.

**Copper**—With the red metal selling at the highest price in eight years, 16 cents

## U. S. Plane Licenses Pass 10,000 Mark

WASHINGTON, Nov. 8—Numbers have been assigned to 10,000 airplanes by the Department of Commerce whose aeronautics' branch licenses and identifies aircraft, it has been announced. The first license issued by the Department was C-26, on October 26, 1927, to Wendell Pavey, of Cincinnati, Ohio, whose plane is still flying. Since numbers above 9999 would run into five places and encumber the wings, the ten thousandth license started the E series, reserving E-1 to 25 for its own planes and issuing the ten thousandth license as E-27, with E-26 held in abeyance because of a question involving change of numbers on the plane involved. Schlee and Brock, of 'round-the-world fame, got E-27.

delivered Connecticut and 16½ cents, delivered Middle West, and refineries operating to capacity, there is much speculation as to whether production will not be stimulated to a point where the producers will be unable to check the flow of supplies from mines and customs smelters. On the other hand, there is also talk of a 17 cent market. Leading producers are striving earnestly to hold the market where it is, their program of higher prices having virtually been accomplished for the time being.

**Tin**—The market rules rather quiet at around 50 cents for Straits tin.

**Lead**—The market rules quiet at unchanged price levels.

**Zinc**—Demand is moderate; producers continue quotations unchanged.

## Pierce-Arrow Sales Gain 100 Per Cent in October

BUFFALO, Nov. 5—A gain of 100 per cent in shipments of the Series 81 car over the corresponding period last year is reported for October by Pierce-Arrow Motor Car Co. This record increase tops all previous high monthly sales gains made during the summer and fall months. October's increase in passenger car shipments was accompanied by an equally important one for trucks, the total of shipments being double that of one year ago.

A review of shipments of Pierce-Arrow passenger cars for the past three months shows the big advance made. August registered a gain of 82.5 per cent over August, 1927, in Series 81 shipments. During September a gain of nearly 50 per cent was made over the corresponding month one year ago, while in October the increase jumped to 100 per cent.

## Hupp Signs 94 Dealers

DETROIT, Nov. 5—Hupp Motor Car Corp. reports the signing of 94 dealers during October.

## September Exports \$5,033,092 Over '27

Decline of \$14,602,841 From August is Shown—Australia Leading Market

WASHINGTON, Nov. 8—Although September automobile exports from the United States fell off, in the usual seasonal decline from the August totals, the total exports of automobiles for September reaching a valuation of \$34,162,711, were \$5,033,092 higher than September, 1927, the Department of Commerce announces. This was a 17 per cent increase. The exports were \$14,602,841 lower than the August exports.

Australia again occupied the position as leading market of importance for both passenger car and truck shipments. Argentina, which led in passenger car takings in August, dropped to third position as a market for passenger cars, Canada advancing to second position during September. The average value of passenger car shipments during the months was \$744, as compared with \$704 in August and \$608 in July.

Closely following Australia, Brazil was in second position as a truck market during the month, with Canada and Argentina next. Average value of trucks exported rose to \$717 as compared with \$625 in August and \$635 in July.

## Mono-Aircraft Adds Models

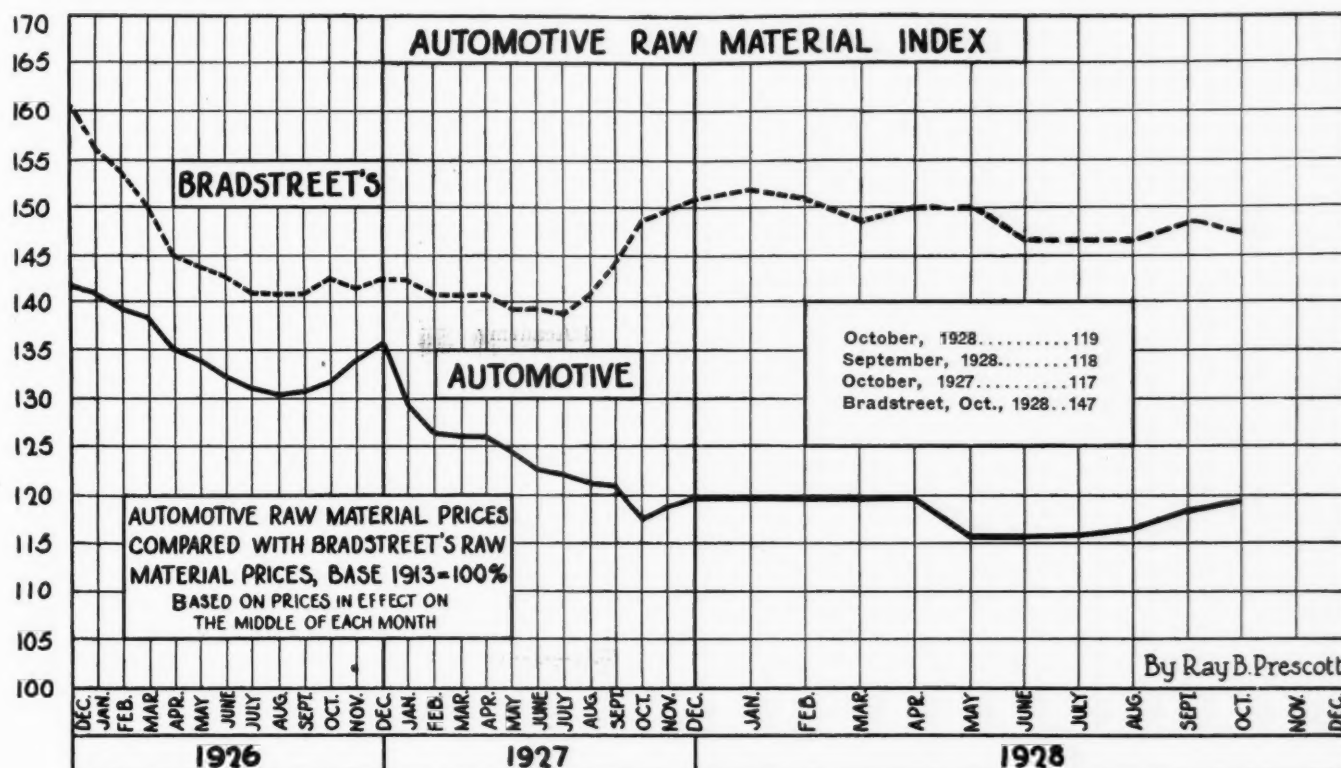
MOLINE, Nov. 3—The Mono-Aircraft Co., Inc., this week announced plans for development of a monocoach, a four-place cabin plane for the commercial flier, and the monoprop, a two-place open plane for flying schools. To provide financing of this expansion program, directors have authorized issuance of the remaining unissued 357 shares of preferred stock and 16,190 shares of common stock to the present preferred and common stockholders on basis of one share of preferred for each share of preferred now held with additional right to subscribe for common stock, one share for each preferred share now held. The remaining common stock will be offered to common stockholders upon basis of ratio now held by each subscriber to the total common stock now issued. Preferred is offered at \$50 a share and common at \$5, subscriptions payable in cash at time of entering the subscription, the offer being open 30 days.

## Shanklin Elects Shay

SPRINGFIELD, ILL., Nov. 5—Warren J. Shay has been elected vice-president and general manager of the Shanklin Mfg. Co. Mr. Shay was formerly associated with Champion Spark Plug Co. and for the past six years, sales manager, automobile division, of the Columbus-McKinnon Chain Co.



# Raw Material Index Rises One Point



## Krupp and Ludlum Pool Patents in U.S. Company

NEW YORK, Nov. 3—Pooling of patents owned by the Krupp Steel Works of Essen, Germany, and the Ludlum Steel Co. of New York, has been arranged by the formation of a new American corporation, the Krupp Ni-rosta Co., Inc. The Central Alloy Steel Corp. and Firth Sterling Steel Co. are also interested in this deal as licensees of the products handled.

Both the Krupp and Ludlum companies have assigned to the new company important patents covering the steel known as Ni-rosta and other alloy steels.

Krupp representatives also have announced that they have entered into an agreement with the General Electric Co. through which that company will use "carboly," a new high speed cutting steel, in the United States.

## Buys Large Houde Interest

BUFFALO, Nov. 5—New York Car Wheel Co. has bought a large interest in Houde Engineering Co., and F. B. Cooley, president of New York Car Wheel, is expected to become chairman of the board of the Houde company. The purchase by the new interests assures additional working capital necessary to handle new business now being received.

## Brown Gets Ford Order

DETROIT, Nov. 3—Brown Mfg. Co. has announced the receipt of a substantial order for lamps from the Ford Motor Co. This order, with heavy busi-

ness from Hudson-Essex, Chrysler, Nash and other companies, indicates unusually heavy production for the last quarter of the year.

## Spicer Gets Ford Order, Delays Moving Factory

DETROIT, Nov. 1—Spicer Mfg. Co. is in process of moving its plant from South Plainfield, N. J., to Toledo, and headquarters of the company will be established at Toledo about Jan. 1, according to R. C. Carpenter, vice-president. The company had expected to make the transfer earlier but the procurement of a large contract from Ford Motor Co. has delayed plans. The company is now manufacturing 4500 shock absorbers a day for the Ford company under the Houde patents.

## Olds Makes Plant Changes

DETROIT, Nov. 3—Olds Motor Works ceased production Oct. 31 to make changes in the plant which will substantially increase production facilities in 1929, which is planned to be the greatest year in the history of the company. Production will be resumed Dec. 1 on a production schedule of 6000 for the month. The Olds plant of Fisher Body also will remain closed throughout the month.

## Wright Lowers Price

DETROIT, Nov. 3—Wright Aeronautical Corp. has reduced the price of its Whirlwind engine from \$4,900 to \$4,000 and increased the output to 500 engines a month.

## Graham-Paige to Award Prizes for Service Work

DETROIT, Nov. 3—Twenty district service supervisors of Graham-Paige Motors Corp. will share in the distribution of \$2,300 in 10 prizes, the first being \$500, offered in a contest designed to reward initiative and aggressiveness. The contest, covering two months, ending Dec. 15, is to be scored on the basis of credits for achievements in the various branches of the supervisor's work, such as stimulating dealers to maintain increased parts stocks, to purchase special tools and equipment recommended by the factory, and to install factory approved record systems and flat-rate service. Winners will be announced Dec. 24.

## Westinghouse Net \$1,720,112

NEW YORK, Nov. 3—Westinghouse Air Brake Co. and subsidiaries report net income for the quarter ended Sept. 30 as \$1,720,113 after all charges. This is equivalent to 54 cents a share and compared with \$1,492,382, or 47 cents a share, for the preceding quarter and with \$1,735,825, or 55 cents a share, for the third quarter of 1927.

## Curtiss Earnings \$814,791

NEW YORK, Nov. 3—Curtiss Aeroplane & Motor Co., Inc., reports net profit for the first nine months of the current year before Federal taxes as \$814,791 against \$549,071 for the corresponding period last year. Earnings for the September quarter were \$222,946 as compared with \$116,819 last year.

## Meyer Wins A.A.A. 1928 Racing Award

WASHINGTON, Nov. 3—Louis Meyer, a virtually unknown racing driver until he won the Indianapolis classic in May, has jumped into national prominence by winning the American Automobile Association speedway championship for 1928.

Ray Keech, of Philadelphia, who captured the world's speed record from Capt. Malcolm Campbell at Daytona Beach, won second place on the championship list and Lou Moore, who placed second at Indianapolis, was third. Meyer accumulated 1596 championship points for the year, while Keech won 915 and Moore 406.

The A.A.A. statement on racing said in part:

"All of the existing 91.5 cu. in. records established in previous years remained intact with the exception of a new 100-mile record established by Keech in a non-championship event over the Atlantic City speedway on Sept. 16, when he averaged 131.805 miles per hour for this distance.

"There was a decided falling off in major races during the year, with but three of the speedways running events, while a fourth speedway event was abruptly stopped by a series of accidents.

"In addition to the 'big three' on the 1928 championship list, George Souders placed fourth, winning all of his points when he finished third at Indianapolis. Bob McDonogh landed in fifth place, his best performance being that at Altoona when he was runner-up. The next five drivers in order of placement were Fred Frame, another Pacific Coast driver; Norman Batten and Cliff Woodbury, racing veterans, and Billy Arnold and Bill Spence, both newcomers to the Eastern speedways."

### William Huntington May

LOUISVILLE, KY., Nov. 3—William Huntington May, 79 years of age, vice-president of the Shuler Axle Co., died Oct. 30, at the Norton Infirmary, following a three weeks' illness.

### Coming Feature Issue of Chilton Class Journal Publications

Nov. 17—Production and Factory Equipment Issue—Automotive Industries.

## Highway Research Board to Meet in Washington

NEW YORK, Nov. 3—The Highway Research Board will hold its eighth annual meeting at the National Academy of Sciences, National Research Council Building, Washington, Dec. 13 and 14. This is to be an open meeting and it is expected that a large number of persons interested in highway problems will attend.

Among the committee reports to be rendered at this meeting will be discussions on structural design, character and use of road materials, highway traffic analysis, highway finance, cause and prevention of highway accidents, economic theory of highway improvement and maintenance.

## Electric Railway Lines Use 887 Buses in 1927

WASHINGTON, Nov. 3—A survey of operations of 235 electric railway companies, operating a total of 12,277 miles of road, compiled and made public by the Interstate Commerce Commission, shows that these companies were operating 887 buses and 9911 passenger-carrying cars during 1927. The figures are obtained from annual reports filed with the commission by the railways.

### Willys Forms French Company

PARIS, Nov. 3—Willys-Overland Crossley (France) is the title of a company just formed under French laws for the sale of American automobiles and particularly Willys-Knight engines in this territory. The capital is 100,000 francs in 500 franc fully paid shares, and can be increased to 500,000 francs.

## Nine Companies Join in Aviation Combine

CHICAGO, Nov. 5—Nine established aviation companies will form the nucleus of the Universal Aviation Corp., which jointly with the Western Air express Co. recently acquired control of the Fokker Corp. of America. The companies which will enter into the \$6,000,000 consolidation are the Universal Air Lines, Inc., the Robertson Aircraft Corp., the Northern Aircraft Corp., the Universal Air Lines System Terminal Co., The Mid-Plane Sales & Transit Co., the Northrup Airplane Co., Air Transportation, Inc., Egyptian Airways, Inc., and Robertson Flying Schools, Inc.

The new company will engage in the operation of passenger, mail and merchandise planes, and also conduct flying schools and selling agencies. There will be unit headquarters in Chicago, St. Louis and Minneapolis. Louis H. Piper of Minneapolis will head the organization. Among the Chicagoans on the board are B. G. Dahlberg, Frank A. Mitchell, Thomas G. Cassidy and T. L. Kesner.

In addition to the capital invested in the companies entering into the merger, approximately \$5,000,000 is being added through an issue of common stock.

## Petroleum Institute to Meet

NEW YORK, Nov. 3—American Petroleum Institute will hold its ninth annual meeting Dec. 3 to 6 at the Stevens Hotel, Chicago. Monday is to be reserved for a meeting of the directors, with general sessions beginning Tuesday with the president's address. This will be followed by talks on the value of standardized oil field equipment by W. G. Skelly of Skelly Oil Co., and by Craig B. Hazelwood, president American Bankers Association.

## Moto Meter Net \$237,765

NEW YORK, Nov. 3—The Moto Meter Co., Inc., and subsidiaries report net income for the quarter ended Sept. 30 of \$237,765 as against \$168,971 for the corresponding quarter in 1927.

# Calendar of Coming Events

### SHOWS

Aeronautical Exposition, Coliseum, Chicago ..... Dec. 1-9  
American Road Builders Association, Inc., Cleveland Auditorium.....Jan. 14-18  
Automobile Salon, Inc., Hotel Drake, Chicago .....Jan. 26-Feb. 2  
Automobile Salon, Inc., Hotel Biltmore, Los Angeles.....Feb. 9-16  
Automobile Salon, Inc., Hotel Commodore, New York .....Dec. 2-8  
Automobile Salon, Inc., Palace Hotel, San Francisco .....Feb. 23-Mar. 2  
Boston, Mass., Mechanics Bldg.....March 2-9  
Brussels .....Dec. 8-19  
Buenos Aires .....Nov. 29-Dec. 9  
Chicago, National Coliseum, Jan. 26-Feb. 2  
New York, National, Grand Central Palace .....Jan. 5-12  
Paris, trucks .....Nov. 15-25  
Western States Metal and Machinery Exposition, Los Angeles.....Jan. 14-18

\* Will have special shop equipment exhibit.

### CONVENTIONS

American Road Builders Ass'n, Inc., Cleveland Auditorium .....Jan. 14-18  
American Society of Mechanical Engineers, Annual Meeting, 29 W. 39th Street, New York City.....Dec. 3-7  
American Society for Steel Treating, Semi-Annual Meeting, Los Angeles .....Jan. 14-18  
National Highway Traffic Assoc., New York City, 12 E. 53rd St.....Dec. 11-12  
Chicago Power Exhibition and Conference, Coliseum, Chicago.....Feb. 12-16  
International Air Conference, Washington .....Dec. 12-14  
Chicago Aeronautical Assoc., Stevens Hotel, Chicago, Ill.....Dec. 5-6  
Manufacturers & Distributors of Motor Truck Equipment, Cleveland, Ohio .....Jan. 15  
National Association of Finance Companies, Hotel Roosevelt, New York .....Nov. 20-21

National Automobile Dealers Association, Palmer House, Chicago.....Jan. 28-29  
National Metal Congress, Los Angeles .....Jan. 14-18  
National Research Council, Washington .....Dec. 13-14

### S. A. E. National

Chicago, Dec. 6-7—Aeronautic.  
Detroit, Book-Cadillac, Nov. 22-23—Production.  
Detroit, Book-Cadillac, Jan. 15-18—Annual.  
New York, Hotel Astor, Jan. 10—Annual Dinner.

### Sectional

Cleveland .....Nov. 19  
Detroit .....Nov. 22  
Metropolitan .....Nov. 15  
New England .....Nov. 21  
Washington .....Nov. 21